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THE CONSOLIDATED ELECTRIC LIGHT CO.

GEORGE WESTINGHOUSE, Jr., President,

OWNERS OF THE

SAWYER-MAN PATENTS,

GENERAL OFFICE:

32 Nassau Street, New York.

SPECIAL NOTICE.

THE MATHER ELECTRIC CO.

H. G. CHENEY, President,
ROBT. CHENEY, Vice President,
P. H. WOODWARD, Sec. and Treas.

N. T. PULSIFER, General Manager,
RICHARD H. MATHER, } Consulting Electricians.
WM. A. ANTHONY, }

MANCHESTER, CONN., March 3, 1888.

The Mather Electric Company hereby notifies its patrons that, with a view of protecting their interests and its steadily increasing business, it has obtained from the Consolidated Electric Light Company, the owner of the Sawyer-Man patents covering the manufacture, use, and sale of incandescent lamps, the protection of said patents, and will at an early date supply its patrons with lamps manufactured by the Sawyer-Man Electric Company, the commercial agent of the Consolidated Electric Light Company.

H. G. CHENEY, President.
N. T. PULSIFER, Gen'l Manager.

SAWYER-MAN ELECTRIC CO.

HENRY C. DAVIS, President,

COMMERCIAL AGENTS OF

THE CONSOLIDATED ELECTRIC LIGHT CO.,

GENERAL OFFICE:

32 Nassau Street, New York.

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ELECTRICAL REVIEW

ILLUSTRATED.

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BELL WINS.

The U. S. Supreme Court Decides in Favor of the Bell Company on Every Point.

The Supreme Court of the United States handed down its opinion in the great telephone case on Monday last. The opinion is in favor of the patents of Alexander Graham Bell, now owned by the American Bell Telephone Company of Boston. The vote of the court was said to have been four to three. This will effectually set at rest the infringement of the Bell patents, and will place the telephone licensees of the Bell Company in a stable and secure position. There was general rejoicing among the telephone fraternity upon receipt of the news. In our next issue we hope to give the decision in full. For the present it is enough to know that the decision has been made, and that it recognizes the claims of the man who is, we think, entitled to the honor.

Electric Conduction by Air.

M. J. Borgmann has succeeded in transmitting the intermittent current from an induction coil through a considerable air space by means of flames as electrodes. The circuit was made through the earth, the induction coil, the flame electrodes, and a telephone or galvanometer detector. With an air space of 6 metres between the flames the telephone sounded; and 11 metres could be intervened when the telephone was connected to a large metal shield. These experiments remind us, says *Engineering*, of Mr. Edison's railway telegraph, and of some private experiments of Professor Hughes shown to friends several years ago.

Electricity Better than Gas.

Dr. Renk, of Munich, has been experimenting on the utility of the electric light, from a sanitary standpoint, in the National Theatre of Munich. He found that the electric light had hardly any influence on the deterioration of the air, whereas the gaslight raised the temperature of the room, deprived the air of its oxygen and rendered it injurious by increasing the carbonic acid, especially in the higher regions.

Electric Lighting in London.

An attempt to try the electric light, on a large scale for street purposes in London, has for the present failed. The City Commissioners of Sewers proposed to allow the Brush Company to light the whole district from Cheapside, Ludgate Hill and Fleet street to the river. The company was to receive only $22,000 a year, but was to enjoy a monopoly of the supply for private houses. The light was to be equal to thirty-two times that of gas, while the cost would be rather more than double. At a meeting of the commissioners, however, it was argued that so much light was not wanted, and that it was unfair to tax the whole city for a luxury supplied only to a part. The proposal was, therefore, referred back.

An English Opinion of the Electric Club.

The *Electrician*, of London, remarks editorially of the Electric Club as follows:

"The opening of the New Electric Club House in New York seems to have been quite a brilliant affair, and promises well for the future of the electrical profession. The building is described as spacious and handsome, and so arranged as to meet the requirements of a scientific society while fulfilling all the purposes of a professional club. About 400 members engaged in electrical business or research have been already enrolled; and it is probable that similar clubs will be started in other large towns of the United States. We know of no institution in this country exactly corresponding with the New York Electric Club House; nor perhaps is there any need for it, the habit of Englishmen being emphatically to drop their business when they go to their club. England, however, possesses an abundance of separate institutions representing all branches of science and industry; and it is mainly to make up for its deficiency in this respect that in New York the functions of club and institute are sometimes combined.

"Prof. Rowland dwelt on this point in the course of his interesting address at the opening of the Electric Club, remarking upon the advantages which Faraday enjoyed in being so closely associated with the science of Europe, encouraged by the Royal Society at which to announce his discoveries, and by the Royal Institution in which to make them—advantages which no man however naturally endowed, could have obtained in America either then or now. Prof. Rowland's address, brilliant and sympathetic as a scientific memoir of Faraday, was still more valuable as an appeal to American public spirit to emulate the example of the old country, which has always been in the forefront of scientific progress."

Electric Lighting in Germany.

According to the presidential address of Dr. von Stephan, at the Berlin Society of Electricians, there are at present in use throughout Germany, 15,000 arc lamps and 170,000 glow lamps, supplied with current from about 4,000 dynamos. Dr. von Stephan estimates that an arc lamp requires on an average ¾ horse-power, and a glow lamp ⅛ horse-power. On this basis the total horse-power employed in electric lighting throughout Germany amounts to 30,000 horse-power.

Telephones in the Hospital.

Telephonic communication between the ten separate blocks into which the National Hospital for Consumption, Ventnor, Isle of Wight, is divided, has now been completed by the Equitable Telephone Association, Limited, of 75 Queen Victoria street, E. C., who have fitted one of their Swinton telephones in each block, and one in the porter's lodge, making eleven in all. These instruments are connected to a central exchange switchboard in the head nurse's room, whereby any one block can be put into communication with any other in a few seconds. Arrangements have been made to admit of the system being extended to the private residences of some of the medical officers who live in Ventnor should this be considered advisable at some future time. The installation is expected to prove a great convenience to the hospital staff, the length of the building being a quarter of a mile.

Annual Dues Raised.

The National Electric Light Association, through Secretary Harding, has issued the following notice to the members of the association:

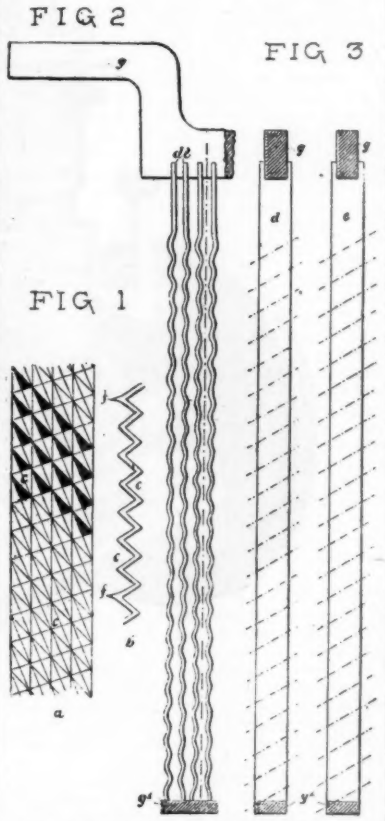
At a meeting of The National Electric Light Association, held in Pittsburgh, February 21st, 22d and 23d, 1888, the following resolution was offered and adopted by the convention unanimously, increasing the annual dues from $10 to $20.

"The annual dues shall be $20, payable in advance, and shall cover the calendar year."

You will please take note of the same.

The Electric Resistance of Cobalt.

Dr. G. Faé, of the University of Padua, has lately made a series of experiments on the resistance of cobalt and antimony when placed in a strong magnetic field. His experiments show that under these conditions the resistance of antimony is increased, both in the direction of the lines of force and perpendicular to them, but the increase in the direction first named is, however, the greater. In the case of cobalt, the resistance is increased in the direction of the lines of force, but decreased in the perpendicular direction. Antimony therefore acts like bismuth, and cobalt like iron and nickel, as would be anticipated from the chemical properties of the different substances.



SKETCHES SHOWING DUJARDIN'S STORAGE BATTERY IMPROVEMENTS.

The Paris Electrical Laboratory.

The Society, now under the presidency of M. Mascart, has appointed M. de Nerville as general director of the laboratory. This gentleman is a telegraph engineer, and is well known in France for the work he did there years ago in connection with MM. Mascart and Benoist in making a determination of the legal ohm. The programme of the laboratory is a fairly wide one. It is proposed that facility should be given to private individuals and manufacturers of electrical machinery for making researches which they could not carry on at their own laboratories or works. It is also proposed to standardize electrical measuring instruments, and to supply with each instrument which has been tested, a certificate showing its limits of error; also to test electrical machinery generally, and to institute researches which the International Society of Electricians might deem of sufficient general utility.

Dujardin's Improvements in Accumulators.

For the formation of the salts of lead, instead of deriving the oxygen necessary to effect the oxidation of the lead entirely from the water, it is derived from an acid solution of an oxydizing salt added to the water, such acid solution being capable by the passage through it of an electric current, of producing a soluble salt of lead, which is immediately decomposed by the acid of the bath into an insoluble salt assuming the state of peroxide of lead.

Thus, by employing alkaline nitrates the bath may be composed as follows: 10 kilogrammes of water, 2 kilogrammes of sulphuric acid, 1 kilogramme of alkaline nitrate (of soda, ammonia, potash or other suitable alkali). By the passage of an electric current nitrate of lead is formed, which, by the acid of the bath, is converted in a continuous manner into sulphate of lead, and afterwards into peroxide of lead. In some hours, without discharging or reversing the current, the positive plates become covered with an adherent layer of crystalline peroxide of lead, which may be over a millimetre thick, and of a great electrical capacity. In order to increase and regulate the formation of the salts of lead, it has been found that it is useful to introduce large volumes of air into the bath. This may be effected either by forcing the air into the bath by raising and lowering the plates, or by other convenient means. The reaction is thus doubled whatever may be the composition of the bath. In order to facilitate the adhesion of the peroxide upon the plates, the latter are constructed in a cellular manner, as shown in Fig. 1, *a* representing the surface of the plate, and *b* an edge view thereof. The form of the cells, *c*, may be varied as well as the size thereof, those in the drawing being magnified to about four times the original size. It will be observed that in forming the cells, the lead plate is not perforated in such a manner as to afford a passage from one side to the other. In a few hours the peroxide which is formed at the expense of the lead, fills the small cells and adheres strongly thereto. To prevent the plates from coming into contact with each other in such manner as to interfere with the free circulation of the acid and the gases, they are corrugated, as shown in Fig. 2, the corrugations running obliquely across the plates, the obliquity of adjacent surfaces being in opposite directions. Thus the surfaces of the plates, *d*, *e*, which are opposed to each other in Fig. 2, are shown opened out bookwise in Fig. 3, the oblique lines indicating the direction of the corrugations, which in this position of the plates are all in the same direction; but if one plate be turned and laid with its face downwards or towards the other, then the corrugations will be in opposite directions, and will cross each other, and will only be able to come into contact at points separated by the width of the corrugations. Instead of corrugating the plates, projecting points, *f*, (see Fig. 1, *b*) may be formed thereon, which will prevent too close contact, and leave a free passage for the circulation of water and gas. As the dilatation or expansion of the corrugated plates subjected to an active formation may amount to 10 per cent. of the

length of the plates, it is practically impossible to pack them in a rigid frame. To allow for this dilatation, the plates may be suspended from a bent rod or bar, *g*, shown in elevation in Fig. 2, so that the plates are free to expand towards the bottom of the cell. The plates may be soldered to the bar, *g*, and also at their bottom edges to a second bar, g^1, parallel to the bar, *g*, as shown in Figs. 2 and 3.

Combined Engine and Dynamo at Ordnance Survey, Dublin.

The electrotyping of the maps of the English Ordnance Survey office at Dublin is now effected by a small Goolden dynamo, the details of which installation may interest our readers. There are eleven plating vats, and the normal output of the dynamo is only 7 volts and 40 amperes. A combined engine and dynamo to give this output was specially designed, consisting of a Willans central valve engine of the smallest size (namely, a single engine with one cylinder 5 in. in diameter and 3 in. stroke), and a Goolden dynamo. The armature of the dynamo is keyed on to the crankshaft of the engine, prolonged sufficiently for the purpose; *i. e.*, there is no coupling, neither is there any outside bearing, so that the armature is "overhung." The weight of the armature is counterbalanced on the other side of the engine by a flywheel. It will be seen that there are thus only two bearings, *i. e.*, the two engine bearings. The armature is of the Gramme type, and has a resistance of 0.034 ohm when cold. The field magnet is of the single horseshoe type, soft iron core, with cast-iron pole-pieces of large size, and has only one coil. The field magnet is secured to the crank chamber of the engine by means of two gun-metal arms. The dynamo is, therefore, suspended in air, so that the magnet leakage must be very small. The field coil is a plain shunt and has a resistance of 0.49 ohm. It will be seen that when the output is $7 \times 40 = 280$ watts, the current in the field coil is $\frac{7}{0.49} = 14.2$ amperes, so that the loss in the field coil is $14.2 \times 7 = 100$ watts. Further, the loss in the armature is $(40 + 14.2)^2 \times .034 = 96.5$ watts, so that the electrical efficiency is almost 59 per cent., which is very good for so small a machine considering the very low speed at which it is run regularly, namely, 570 revolutions per minute. The rise of temperature in armature and field magnets is only 10° F.

During the last twelve months 280 copper matrices and duplicates have been made, weighing 4,500 lb., and the cost has been 35c. per pound, including cost of dissolving copper and finishing, whereas prior to the introduction of the dynamo and the finishing machinery, the cost was 87c. per pound. —*Engineering London.*

Electricity Everywhere.

An excited daily contemporary in New York, the *World*, is scared over the growing volume of electricity. It says:

The proposition is advanced that pretty much everything that will hold electricity is becoming more or less charged. Fears which have not yet assumed a definite expression are entertained by many observing people to the effect that too much of the subtle fluid is being manufactured and kept in store to be consistent with the public safety. It is thought that much leakage is involved and that the earth, especially in the case of large cities, and the houses are being more or less saturated with it. * * * It is time to call a halt before this thing goes any further. With the telephone, telegraph and electric light plants on the increase, and the electric motor still to come, the situation is really serious and demands prompt attention.

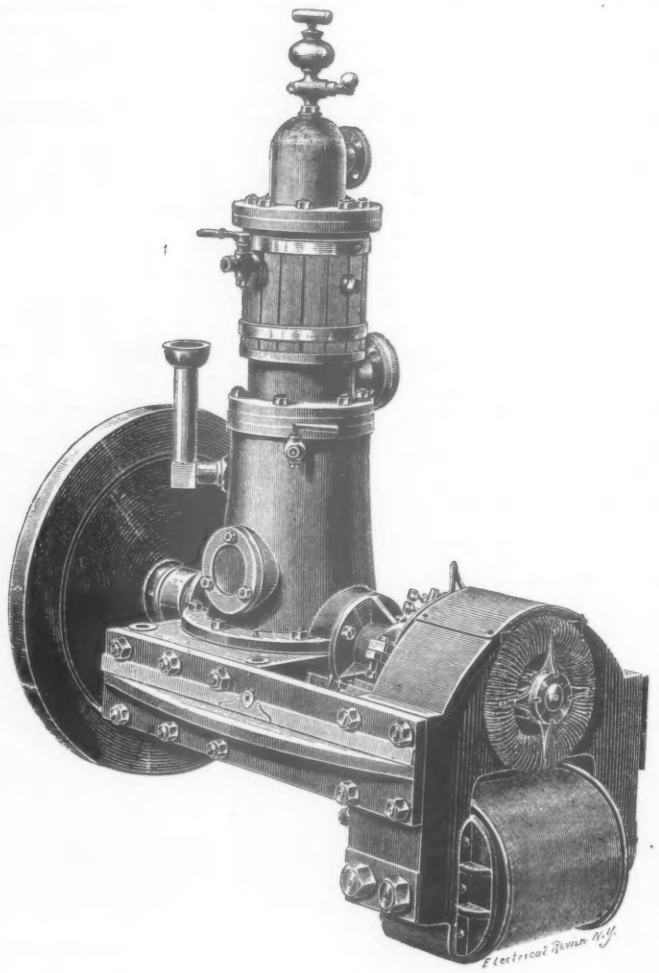
This is rich. We thought the current was conserved into light, heat, mechanical power, or chemical energy, in the effort making its own will and giving up the ghost. But the *World* is omniscient and summarily dispels our illusions, and tells us calmly that electricity is a concrete thing, manufactured fresh every day in chunks, or otherwise; but humanely warns us that the packages leak and the houses are fast becoming soaked with the dangerous ooze! Will the *World* not kindly add information as to the color and smell, and the proper disinfectant to use against the ravages of this new destroyer?

—— The Edison Company has been granted a franchise in the City of Albany.

Alternating vs. Continuous Currents.

PAPER READ BY M. M. M. SLATTERY, OF FORT WAYNE JENNEY CO., BEFORE THE CHICAGO ELECTRIC CLUB, MARCH 19TH.

A few days ago when I had the honor of receiving an invitation to read a paper before this Club to-night, relating to the alternating system in parallel arc, to be in reply to Mr. Leonard's paper, I felt, understanding Mr. Leonard's proclivities, that the usual stereotyped attack would be made upon a system which has alike elicited the admiration of those who have disinterestedly given the subject some thought, and the most rancorous feeling on the part of those whose business has been placed somewhat in the background by the rapid developments which have taken place in this comparatively new field of electric lighting. In a moment of unguarded enthusiasm I accepted the invitation. As some of you may know, I am practically engaged in the alternating branch of electric lighting, and my time is so much occupied therein as to almost entirely preclude me from having any to either write or read papers. I regret, therefore, that in this short paper I shall not be as comprehensive as I should wish, and will principally confine myself to replying to some of the salient points in Mr. Leonard's paper.



COMBINED ENGINE AND DYNAMO, DUBLIN.

We are told that the following are the sum total of the vital factors in a general suply system of electric energy, viz:

1st. Cost.
2d. Economy (efficiency and depreciation).
3d. Reliability.
4th. Safety to life.
5th. Variety and value of the possible sources of revenue.
6th. Effects upon existing property.

The factor of distance over which you have to transmit the electric energy is conspicuous by its absence, not being considered of sufficient importance to be enumerated in the list; we shall see presently of what value this factor is. Of course Mr. Leonard, as is customary with advocates of the low tension systems, starts out with explaining the transcendent merits possessed by the three wire systems, and expresses in the usual terms the 33 per cent. saving over the two wire system.

In the paper read by Mr. Leonard, elaborate tables of figures are given, into which I will not attempt to follow him in detail to-night. It would only weary you, and, as you are aware, if the premises are once granted, almost anything can be proved by figures. All I would say is, examine those figures yourselves, but do not *assume* that the *data* are correct.

It is a very ingenious rhetorical device to take the cost of the Edison system for distribution over a small area, and compare it with the cost of the alternating system over a small area, and thus show that, taking price of converters into consideration, the Edison is the cheaper. This is avoiding the question. The chief claim made for the alternating system is that it can reach customers and supply a market that the low tension *never* can.

Another point to which I would call your tatention is this: Mr. Leonard assumes the cost of copper to be 16 cents per pound—*he had to*—so as to bring his estimates at all within bounds. Now, we all know that the price of copper is more like 25 cents than 16 cents. The variation in the price of copper affects the low tension system much more seriously than it does us, another point in favor of the alternate converter system. It may be said, "Yes, but you have to use copper wire in your converters as well as your lines." True, but only to a limited extent; the cost of the converter is also largely made up of the iron and the labor. The quantity of wire in a good converter is but small.

Another reason why I do not care to take up your time with a detailed discussion of these figures and tables is that the field has been pretty well covered by Mr. Stanley in a paper recently read by him in Boston, and also for the reason that Prof. George Forbes, who is recognized as one of our best authorities, has said with regard to the theoretical economy of the three wire system that "this may suit American financiers, but is *not* electrical engineering."

Mr. Leonard is not warranted in assuming a thing in order to enhance the value of his claims; he says we may look forward to improvements in the incandescent lamps which will result in 30 per cent. reduction in the cost of conductors in the three wire system. I have been engaged in the manufacture of incandescent lamps for some 12 years, and, as I have to follow the subject up closely, I trust I ought to know a little about the improvements which have been made in the past and the possibilities ahead for the future, and I find that for the four years just past, very little has been done towards improving, either the life, or the efficiency of incandescent lamps. A so-called improvement by a well known company, the Edison, has lately been trumpeted in every direction. Why! Swan has been making such a lamp in England for some five years, and so could this same company have made them if they only employed methods which are equally within the reach of all.

The reason for this recent claim is obvious—it is an offset to the large number of lamps per horse-power claimed for the induction system.

With regard to this claim put forward on behalf of the Edison Company of being able to obtain twelve 16 candle power lamps to the horse-power, I will not dispute it, but simply say that the gentleman who was for four years the mechanical engineer of the Edison Electric Light Company has, within the past six months, given sworn testimony in these words: "In the direct current, central station system, the maximum which, to my knowledge, has so far been obtained, is between six and seven lamps to the horse-power."

Now, gentlemen, a 100 volt lamp, such as is the Edison, could certainly be made which would run, say 12 to the H. P.; yes, 15 or 20, but what would the life of those lamps be? In all probability, as far as our present knowledge goes, *very brief*. I prefer, in a case like this, to reply upon an absolute statement of fact rather than upon any promises or guarantees or possibilities.

The limit of voltage at which a lamp can be made so as to have a reasonable life has, it seems, been reached in its upward direction at about 110 volts. It was anticipated a few years ago that a high volt, small current lamp was the great desideratum. Scarcely any progress in that direction has, however, been made for some time as I have just said, and the tendency in fact now appears to be the other way, *i. e.*, towards low resistance lamps—say 50 volts.

The continuous current system is far more susceptible to heavy fluctuations than the alternating, owing to the total absence of automatic regulation in the former, and, when it is remembered that the light intensity of an incandescent lamp does not vary as the potential difference at its poles, but in a much greater ratio, it will be readily understood that the fluctuating system has a much more hurtful effect upon the delicate incandescent lamp than the non-fluctuating system. I am supported in this statement by, not the opinion, but by facts deposed to by the gentleman referred to. He says: "The usual percentage of loss in the carrying wires of a direct-current system is fifteen per cent., and even with this heavy loss the carrying wires attain a stupendous weight. The practical result from the introduction of this loss in the main wires of the direct-current system is, that when such a plant is running fully loaded, the E. M. F., at the dynamos will be fifteen per cent. higher than at the lamps; whereas, when only lightly loaded, the difference in E. M. F. at the dynamos and lamps runs down to a much smaller figure; therefore, in order to maintain the lamps at a uniform brilliancy, the E. M. F. at the dynamos must be carefully watched and adjusted to suit the varying requirements of the load, as in the absence of such care the brilliancy of the lamps will fluctuate and give rise to serious lamp breakage. This regulation of the E. M. F. is accomplished partly by regulating the field-magnets of the machine and by the introduction of artificial resistances in the main carrying conductors. The attention to secure these results is expensive, and the devices for accomplishing them are very costly."

There is another matter in connection with central station arrangements which, it seems to me, disposes of the question of the relative commercial merits of the two systems in a conclusive manner, and that is this: The advocates of the low tension systems admit that as far as actual wire goes, the 1,000 volt distribution is more economical than is the 100 or 200 volt—that is a palpable matter. But, say they, in addition to the danger and the other objectionable features of your plan, the cost of your converters is so great as to neutralize whatever advantages you may have in this way. Without going into that point for the moment, it will be seen that the converter itself costs no more whether the current supplying it comes from 1,000 or 10,000 feet away; that being so, the difficulty which stares the Edison system in the face is the practical necessity of picking out for their central station about the most expensive piece of real estate in the district to be lighted. They *must* be near the centre. They say so themselves. On the other hand, with the high tension induction system, you may have your central station in the outskirts of the town on cheap land, perhaps

on a canal bank or railway siding, so as to unload your coal direct into your boiler room, which may itself save many hundred dollars per annum, while the extra length of the comparatively small conductors would be but a bagatelle compared with the real estate investment in the centre of the town.

That I am not speaking off the book in this matter will be seen when I quote a passage from a document issued by the Edison Company, entitled "Information to Agents," and relating to the desirability of centrally locating the station. It is as follows:

"*Note*: In a given district to be lighted, the best conditions of economy in street installation are fulfilled when the station is located in the centre of the district. If the station is moved one-quarter of a mile away from such centre the cost will be about doubled. If the station is moved one-half mile away from centre the cost will be about quadrupled. * * * there need be no hesitation in locating it in the most central locality. A few hundred dollars increase in cost of lot will often save thousands in cost of street installation."

The reasons for the prominence which a 50-volt lamp is now acquiring are four-fold, namely, cheapness in manufacture, efficiency, reliability, and that while it is the lowest limit in volts that we should allow ourselves (for distributing reasons) it exactly suits the most efficient construction of converter.

The fewer the number of turns of wire in a converter the better, within proper limits, and, as in a 50-volt converter we have only half the number of turns that we should have in a 100 volt, the advantages of the 50 volt lamp for our purpose will be apparent, the fact also is that, while the manufacture of the 100 and 110 volt lamp has received the greatest attention by manufacturers for obvious distributing reasons, the 50 volt lamp has received comparatively little notice not being recognized as a factor in a general system of distribution.

The Fort Wayne Jenney Company are now making a 40 watt 16 candle power 50 volt lamp. This lamp could just as well have been made long before this, but there was no demand for it such as there now exists, if such improvements as Mr. Leonard predicts for the 100 volt lamp are likely to take place and the ratio of the present efficiency of the 100 and 50 volt lamps holds good, we might look forward to a corresponding increase of efficiency which would enable us to reduce the cost of our converters in nearly the same proportion, that is to say, the cost of a 40 lamp converter would be very little more than for the present 25. There would also be the proportional saving in the cost of interior wiring.

Much has been said and written by the opponents of the induction system about the respective first cost of an induction installation and a low tension continuous current installation, viz, that the low tension is cheaper for very short distances.

This sounds very much like a man who had a continually growing business required an engine, saying that a small engine was cheaper for him than a larger, because the smaller engine just then met his requirement, and after a little time he finds it necessary to dispose of his small engine at a considerable discount for a larger one that will be more adequate to his growing needs. Why not put in at the first that system in which will meet any and every illuminatiug requirement for all time, both at points near to and remote from the source of generation.

I don't know whence the information has been derived, but the theory does exist that with a reduction of the load in the multiple arc induction system there is not a proportional reduction of the energy supplied to the circuit, and that consequently the loss of energy in the line does not decrease proportionately with the load. While this theory would and does apply to a series system of transformers it does not apply to the multiple arc induction system, the latter standing in the same relation with regard to the energy supplied to its circuit as the low tension multiple arc. Upon another occasion I trust to have an opportunity of bringing forward mathematical deductions and power curves incontestably proving this fact.

No doubt a system cannot be considered a reliable one unless you are able to multiple arc your dynamos; well, we are able to do this. It used to be regarded as difficult, but, gentlemen, with a great many of those apparent difficulties, we need only to understand their nature to overcome them, and, although at the present moment we cannot couple as many together as we should wish. I venture to say that by the time such a necessity arises we shall be ready to meet it. It is stated that we cannot multiple arc dynamos economically, as occasionally one dynamo will shift the load and the other dynamo not only will take it, but will drag the other. In an incomplete system this is just what takes place, but a device is brought into operation that varies the speed of the engine according as any variation therein takes place, thus maintaining the speed of all the dynamos coupled in multiple, and their potentials uniform.

A good deal has been said from time to time as to these dangers of the alternating system, and notwithstanding the repeated explanations and statements of those who are acquainted with alternating currents and their use, yet only a week or two ago Mr. Leonard in his paper read before this Club attempted to resuscitate this scare, which we supposed had been forgotten.

Prof. Elihu Thomson has publicly stated that he has taken a 1300 volt alternate current without serious inconvenience. I have myself, as have several of my friends, taken 1000 volts, and in all the cases with which I am acquainted, nothing more than some temporary discomfort followed.

The most serious case of which I ever heard was that mentioned by Mr. T. Carpenter Smith at the Boston convention. In that case the man was not permanently injured, although under the influence of the current for quite a considerable time. Although I would not go so far as to recommend the use of the 1000 volt current as a morning beverage, yet it is absurd to let the impression now, as to the lamp, go abroad that it is necessarily or even probably fatal.

We recognize the fact that an electric current of 200 volts is less dangerous than one of 1000 volts—of course we know that. Does it therefore follow that we shall throw to the winds every advantage that this higher pressure gives us? Because a buggy is less dangerous than a locomotive do we therefore abandon railroads? Because an arc-light system requires more than 100 volts pressure are we therefore to abolish every arc-light in the country? These questions answer themselves. So in time will the other, and "those who came to scoff remain to pray."

There is nothing to prevent us placing our lamps upon existing gas fixtures, unless it be ignorance, or not employing the proper precautions to render the work absolutely safe. It is suggested by some that in order to prevent the high tension primary current being dangerous to life, in the event of a leak between the primary and secondary coils taking place, to ground the secondary; then if a leak took place from the high tension circuit to the low tension circuit and there happened to be a ground somewhere else on the primary circuit, no harm whatever could occur to a person taking hold of the terminal of an incandescent lamp and at the same time touching a gas fixture. While this arrangement makes the use of the lamps by the customers absolutely safe it subjects the entire system to a strain on the insulation which I don't think is quite wise, and, instead of grounding the secondary, I think the better plan would be to ground a sheathing of metal interposed between and carefully insulated from the primary and secondary. So far as safety to life is concerned this is just as good, but has the recommendation of not subjecting the insulation throughout the system to any strain whatever, and has been used for some time with satisfactory results.

A charge laid at the door of the alternating system is that of want of reliability, and a few small break-downs which have occurred are exaggerated to a considerable extent by those interested in other systems. Such matters are liable to occur in all new installations, the Edison not excepted. They are simply boyish indiscretions, errors of youth, and not faults of the system as such. In a very short time the experience we have gained in this respect will bear due fruit, and the alternating be just as reliable as the continuous system. In the absence of gross carelessness there is no reason to the contrary, and, indeed, down to the present time even, accidents have been rare.

With regard to an alternating current dynamo of 1,000 volts being more liable to burn out than a low tension continuous current dynamo of 110 volts, and that the depreciation of the latter is less than the former, this seems to me to be nonsense; understanding the nature of the work that a dynamo has to do, and with proper experience in construction there should exist no reasonable doubt about making one dynamo to work as reliably as the other, this is purely a mechanical matter and the ingenuity of our mechanics is equal to any such emergency as that, and, as to depreciation, I venture to say, in fact I know, that the armature of an alternate current dynamo of the kind I have had any experience of, at full load, does not arrive at anything like the temperature a low tension Edison dynamo does under the same conditions, and we all know what high temperature in a wire has to do with the deterioration of its insulation. Furthermore, by reason of the small quantity of wire necessary in the armature of the alternate current dynamo (for instance, in an 800 light machine made by the Fort Wayne Electric Light Company, there are only twenty pounds of wire), we can afford to occupy more space and thereby have less crowding of the wire; thus we have an opportunity of increasing our insulation in proportion to *e. m. f.* required.

There has been some little uncertainty about the action of converters in respect to the fuses enclosed in the converter box frequently and mysteriously melting. This, however, I find is attributable to the temperature of the converter at full load not being calculated as a factor with the current for the melting point of the fuse, and I think it will be much better for us to be satisfied with an external double pole fuse at the point of junction of the primary coil with the primary line, and a double pole fuse on the secondary circuit as close to the converter as possible; this arrangement thoroughly protects the system, and a possibility of a failure of the converter becomes a very remote one.

It is said that the operating of motors by alternating currents is not a success. Well, it may be admitted that at the present time the commercial operation of alternate current motors has not attained very large dimensions, but who is presumptuous enough to say that, when the present systems of alternate current supply are as old as the continuous, there shall not be as many and as satisfactory motors running on alternate currents as on continuous? Is it for any gentleman connected with the Edison Company to stem the river of invention, to say that the acme of perfection is reached in the triune system of that august body, and to thunder forth electrical excommunication on all heretical expounders of the faith? I trow not. Alternate current motors have been made which have in them the elements of success, and the subject is daily attracting more and more attention from some of our most talented workers in that direction, both practical and theoretical, as examples of which I may mention the valuable paper read quite recently, by Dr. Louis Duncan, before the American Institute of Electrical Engineers, and the earlier one read some months ago by Prof. Elihu Thomson, with which you are no doubt most of you familiar.

The mere fact that motors will work on an alternate current is of course well known. The difficulties are in the regulation, the degree of economy, and other matters. But a *difficulty*, gentlemen, is merely a "thing to be overcome." That is what difficulties are for! *These* will be overcome, as have so many others in the grand field of electrical progress. Why, I remember hearing Dr. Werner Siemens say with his own lips that it was hopeless to expect to make a dynamo with a higher efficiency than fifty per cent.! He lived to see himself mistaken, and perhaps others may do the same. Not ten years ago the "divisibility of the electric light" as it was called was ridiculed as the chimera of an enthusiast's over-heated imagination, and nevertheless where are we to-day?

The objection to the alternating system on this motor question is based on the assumption that it is a desirable thing to operate motors on the same circuit as lights. Now, although at first sight this would seem to be the case, and although I am not prepared with any formal objections to that course, yet I do know of one company that has been running motors on the same circuit as lights, but are now running a separate motor circuit instead, in addition to their lighting circuit. So that there is such a difference of opinion on the question that it cannot be fairly disposed of by any *ex cathedra* utterances of the advocates of any particular system.

One curious fact, which I think is not very generally known, though the information is public property, would seem to show that the Edison Company do not regard the alternating systems as such insignificant opponents as they would have us believe. The advocates of the Edison system profess to regard all these alternating current high tension systems as inferior to their own, and as almost beneath contempt, yet, singularly enough, I find that 12 months and more ago the Edison Electric Light Company of New York, thought enough of one of these systems—the Zipernowsky—to acquire the exclusive right in North America to use all the patents on that system, and to obtain an option to purchase for $20,000 these Zipernowsky patents, so soon as they are granted a broad controling claim in a United States patent, on transformers for alternating currents used on the multiple-arc principle. To say the least, it is strange that a company should be willing to pay such a large sum of money for so worthless a system as they pretend that it is.

Does it not rather show that they are more frightened than they say, and are providing for themselves a *locus penitentiæ*? I think it does.

It may be considered that my remarks sound like a direct attack upon the Edison Co.'s system, but I have admitted wherein the induction system is weak, and only claimed such advantages for the latter as are warranted by fact, and when we know of cases where after large installations had been put in and paid for, such (for example) as that of Tyrone, Pa., the investors found upon careful consideration of the question, that they could make more money by setting aside their original investment and change over from low tension continuous (three wire at that) to high tension induction that I have not spoken too strongly. But, gentlemen, whatever I or anybody else may say in favor of one system and in condemnation of the other system will, from a commercial point of view, affect the subject in dispute very little, and we may rest assured of one thing—that the public at large, whose business it is to study these questions, have discrimination enough and practical knowledge sufficient to enable them to make a wise selection. The respective systems, low tension continuous and high tension induction, are now before the public, and the ascertaining of their respective values is within the reach of those who desire to know them, they will perceive that claiming a thing can't be done will not make it so, for they will see it being done and the great question with the public will be, what does this cost? what profit can I make upon my investment? Be confident that the public will not go far wrong when the information it seeks is placed within its easy reach.

Canandaigua, N. Y.—The Electric Light Company. Capital stock, $50,000.

New York.—The Edison Fire Extinguisher Company. Capital, $50,000.

New York.—The O'Keenan Electrical Manufacturing Company. Capital, $100,000.

New York.—The Citizens' Electric Company, at Fulton and Oswego Falls. Capital, $300,000.

Vineyard Haven, Mass.—An electric light company has been organized here, with Otis G. Stanley as president.

St. Johnsbury, Vt.—A company has been organized to light this town. Capital, $20,000, of which $14,000 has already been taken.

Quincy, Mass.—The Electric Light and Power Company has been incorporated. Capital, $35,000. By W. G. A. Patte and others.

Boston, Mass.—The Electric Light Company has been incorporated. Capital, $1,000,000. Everett W. Burdett and others, incorporators.

Leominster, Mass—The Electric Light and Power Company has been incorporated. Capital, $30,000. G. A. Buffington and others, incorporators.

Hillsboro, Ill.—The Hillsboro Gas and Electric Light Company, Hillsboro, Ill. Capital, $5,000. John J. McLean and others, incorporators.

Union City, Kan.—The Union City Electric Light, Gas and Water Works Company, Strong City, Kan., has been incorporated. Capital stock, $10,000. W. P. Martin and others, incorporators.

Geneseo, Ill.—The Geneseo Light, Fuel and Power Company has been incorporated. Capital, $40,000. George E. Waite and others, incorporators.

Pittsfield, Me.—Two electric light companies have been organized here. Darius Burns is at the head of one, and Davidson Walker leads the other.

Pasadena, Cal.—The Pasadena Electric Light and Power Company, has been incorporated. Capital, $50,000. Joseph M. Glass and others, incorporators.

Coldwater. Mich.—The Coldwater Electric Light, Power and Fuel Company has been incorporated. Capital, $25,000. J. G. Parkhurst and others, incorporators.

Chicago, Ill.—The West Side Incandescent Electric Lighting Company has been incorporated. Capital, $50,000. T. Edward Tuttle and others, incorporators.

Chicago, Ill.—The Central Metropolitan Subway Company; capital, $100,000; to construct underground electric line systems; incorporators, A. C. Schmeltz, M. B. Fisher, and I. A. Doane.

—— A cable from Berlin says that Emperor Frederick has given orders to have his castle at Charlottenburg illuminated by electric light. The new emperor is evidently a man of progress.

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EDITORIAL ANNOUNCEMENT

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

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NEW YORK, MARCH 24, 1888.

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The long suspense is ended at last. The fiat has gone forth, and the Bell patent stands valid, and the keystone of one of the greatest commercial structures the world has ever known is wedged tighter yet by the U. S. Supreme Court. The Court decides squarely that Bell was the first inventor, notwithstanding the alleged anticipations by Reis, Drawbaugh, Varley and many others. The difference between them and Bell was simply the difference between failure and success. We give an abstract of the opinion in another column.

Here's to you, telephone men! You may have to pay your royalty, but infringement is at an end.

After years' of litigation, Bell at length triumphs in the telephone case. We congratulate Prof. Bell.

Many kind and complimentary words on the improvement made in the appearance of the REVIEW have been received. It is a source of much satisfaction to labor in an industrial field so full of appreciative minds.

The creative faculties of our bright electrical inventors continue to vibrate responsive to the stirring measures of the march of electrical progress, and ever and anon stirring into special activity and sounding aloud beautiful harmonies of invention which echo along the pathway of time.

Great is the telephone! During the blizzard a New York daily is said to have telephoned to Boston to have a telegram sent to it by way of London. One can't become accustomed to modern progress all in a moment, and it is to be presumed our daily contemporary never thought to have the message telephoned. Besides, it wouldn't have been so sensational.

Mr. Slattery's paper, elsewhere given in full, is a strong, logical presentation of the question of commercial distribution of electrical energy from the alternating current point of view. Considered as a reply to Mr. Leonard's recent paper, it is especially to be commended for the absence of vituperation, and as containing a broad generosity of purpose that is worthy of the orator. All assertions that this or that cannot be done he sweeps aside with the proofs that it is done, and "*si monumentum quaeris, circumspice.*"

At the meeting of the Electric Club to nominate officers for the year beginning May 1, the best of feeling was manifested. The nominations and the discussion were in the spirit favorable to the club's interest, and the unasked claims of those who had worked earnestly in the past, and had contributed time and means, were fairly recognized. No special regard was had for what in politics is called "locality," and the nominations, therefore, were not based on the nominees' connection with any branch of electrical industry, but on the fact that their interest in the club's advancement had been proven by work in the past.

HOW PRACTICAL QUESTIONS SHOULD BE TREATED.

Our esteemed contemporary, the *London Electrical Review*, thus voices the general sentiment on the subject of the proper treatment of the scientific, but practical questions of the hour:

"The elucidation of elaborate formulæ is not attractive, as a rule, to practical men who have little or no spare time at their disposal. We do not for a moment suggest that strictly scientific papers should not be read—far from it—but we do suggest that the too frequent display of mathematical fireworks should be tempered by subjects which, in nature and mode of treatment, appeal more strongly to the majority of the members and associates."

A LITTLE ELECTRICAL LEARNING IS DANGEROUS.

One would think that a daily newspaper which claims to be the most successful in the world in circulation—both of papers out of its press-room and cash returns into its coffers—such as the New York *World* asserts itself to be, should be progressive enough in these days of continual scientific and mechanical surprises, to employ at least one properly trained reporter capable of writing up items in such lines. The *World's* electrical (?) reporter last week devoted a column to the vagaries of his dynamic intellect, and gave some startling explanations of things electrical: "The electric lights are kept glowing by a very heavy battery current, reinforced by the dynamos. Leaving out the dynamos, the current would be sufficient to knock most men senseless, but with the dynamos added it is enough to instantly kill an elephant." This will be news to our readers. Much more of the same surrounds the one little grain of truth that, on such extraordinary occasions as the blizzard of last week, some little danger exists in the net-work of wires. But that little danger is almost nullified by the management, who are ever alert to detect and remedy foreign contacts, earths and short circuits, if for no other reason than the impending damage to their plant. Current is not admitted to circuits which are known to be defective; and in all cases of doubt tests are made. The worst storm and worst breakdown of wires since the birth of electric lighting has come and gone; yet no one was killed, no one was hurt, no fire was started, no accident of any kind came from the wires that "were charged with death to persons and animals."

Gentlemen, is it not time to shelve this chestnut, and devote the same amount of energy to the more humanitarian task of compelling the gas companies to surround their commodity with such safeguards as will reduce the death rate to a level with that caused by the electric current? And is it not time that a few of our great daily newspapers should have among their corps of able writers, a few whose knowledge of electricity and electrical science will carry them past the lisping and infantile bosh they now and then project upon the reading public? It would help themselves, help the public, and do plenty of good.

The letter of "Observer," elsewhere given, while being perhaps too strong a fling at a body of men who devote themselves sincerely to the study of our science, yet has much food for thought. Certainly no condemnation is too strong for such language and expressions as one member of the English Society is reported to have used. We hope he has been misquoted. While "Observer" is evidently not inoculated with the prevailing anglomania, he should take care lest he get into the fire of anglophobia. We shall be pleased to hear from him again.

We recommend both Mr. Gordon and Mr. Crompton to the calm survey of the question of efficiency of steam engine service in electric light plants given before the recent Pittsburgh Convention. The points there deduced are pregnant with truths which go far towards explaining causes of many of the commercial failures of our English cousins, without any necessity for denouncing the electrical part of the plants.

THE THEORY OF INVENTIONS.

One is at all times ready to note the difference between the precept and practice, and even to consider it in himself during the extempore annual "New Years's resolutions." A person is generally one thing in a generality, and quite the reverse in matters of specific application.

King David was very willing to indorse all that Nathan said until the prophet declared, "Thou art the man!" and it is evident that clergymen of the present day have profited by Nathan's example, by fierce denunciations of distant evils and abstinence from the shortcomings of the pew-holders.

Every one remembers the poem of Thackeray representing the friend of humanity pitying the woes of an organ-grinder, and changing to fierce denunciation when that worthy asked for a sixpence to drink his honor's health.

The inventor is always a lazy man as a matter of principle; but he will think, toil, and delve, all for the purpose of producing something which will save labor. Theoretically he is lazy, but practically he is the most industrious of men.

The boy who invented the method of applying the power of the steam-engine to operate its valves was a lazy boy, one who did not want to work, and so that he would not have to work at the pit's mouth in the Cornish mine, he studied out a method of using the motion derived from an eccentric, which he placed upon the shaft of the engine for the purpose of operating the valves. But did he escape work? Undoubtedly not. The world found something else for him to do.

Although the animus of invention is somewhat of a philanthropic nature, for the purpose of saving labor, yet the result actually obtained from it is not so much the saving of labor as the breaking down of capital. The value of a plant already in existence is destroyed, and a re-investment of the profits of capital into the new appliances is required.

During the adjustment of a loss by fire in a Massachusetts mill, the treasurer of the corporation, believing that the insurance adjustors in demanding that 10 per cent. should be deducted from the cost of a Corliss engine purchased only three years before, considered that they were requiring an excessive amount for wear and tear and for depreciation, and telegraphed the late George H. Corliss for his assistance in fixing a higher value upon the engine.

Mr. Corliss made reply that while the engine had not lost 10 per cent. of its value by wear as a motor, yet in his opinion the insurance companies were remarkably liberal; because his subsequent inventions had increased the value of his new engines, and at the same time diminished the value of former engines to an extent even greater than the wear and tear.

A short time ago, a number of the old magneto-telegraph instruments, at one time in such general use for communication between offices and factories, or different portions of extensive establishments, was sold at auction for their value as old material. What was the cause of this annihilation of value? Certainly not wear and tear, but the subsequent invention of the telephone.

A very successful inventor once declared that invention consisted in the art of knowing what was wanted, and this is undoubtedly true; however, a broader class of inventive work has produced what was needed in defiance of feeling to the contrary, and in the exploitation of many of the great inventions it has been necessary not only to make the article, but also to develop the demand.

But the principle of protection lies at the basis of all invention, a stimulus to the creative skill of every person, holding aloft prizes for the most deserving. It cannot be gainsaid that a patent is not founded on any principle of common law, but is entirely a matter of specific statute law. Nevertheless it exists in obedience to the higher and greater principle of law for the protection of the weak; for if we lived in the millennial age of perfect goodness, every one would concede to others his own rights, without interposition of the protective principle of the law.

As it is, this law defends an inventor in the title to the property acquired by the exercise of the inventive faculties of his mind, just as fully as it does the owner of personal property or real estate in the defence of property which he may have acquired by the exercise of other mental faculties.

What will be the effect of the Bell decision on the small army of inventors in the line of telephone apparatus? We should be sorry to see them relax effort. The telephone is still capable of improvement in many details, and inventors may reap abundant profit yet.

The telephone decision—"We told you so!"

We know who invented it now.

OUR CHICAGO LETTER.

(Special Correspondence.)

Certain words in the English language are said to have no proper rhyming words. An electric light man in Chicago has tackled one of these—"window"—with the following result. He says when he gets his summer vacation he will give the matter more thought. This is the best he can do in this wet weather:

A dealer in sugar and thin dough,
Swore wires at his shop should not in go,
But the lineman came up
With a flourish and whoop,
And put the wires right through his window.

The Western Electric Association, a mutual benevolent organization within the employees of the Western Electric Company, was recently organized under the laws of the State of Illinois, with C. F. Nickle, Aug. J. Oehring, and F. E. Hawk as managers and directors.

The city authorities of Chicago are no respecters of persons. Recently, the treasurer of Cook County wanted a telephone line at his office. The council had a short time before ordered that no new permits should be issued for stringing telephone wires over head in the business part of the city. The telephone company said that inasmuch as there was no room in the conduits, the wire should have to go over house-tops; but the commissioner of public works said, "if the wire can't get there underground it can't get there at all." The wire business is fast coming to a head in Chicago.

E. B. Chandler, General Western Agent of the Gamewell Fire Alarm Telegraph Company, secured a contract a few days since, for a fire alarm system in Muskegon, a town of 25,000 people. The city will, as a beginning, place 10 alarm boxes with strikers, gongs and indicators, and a number of private boxes will be placed in lumber mills, etc.

Will Hubbard, the well-known acoustic telephone inventor, has the sympathy of his friends on account of a dislocated knee, which is confining him to bed just now. The only fear is that Will may invent another telephone while kept in, and so become rich and proud, and neglectful of his old friends.

The 1st of May in Chicago, as in many other cities, is a day of hurrahs and bustle. This year, some of the electric light people will follow the fashion, and move.

The Thomson-Houston people are fitting up a three-story and a basement brick on Michigan avenue, between Monroe and Adams. The building is wired for incandescent and arc plants for both use and exhibition, and will show a decided improvement on the present offices and warerooms.

Horne, of the Excelsior Company, has been quietly fixing up a first floor and basement at No. 11 Adams street, which will be far ahead of the upstairs-wall-pocket-quarters he now occupies.

The Fort Wayne Jenny, Manager Buckley says, are going into Temple Court, to occupy a first floor and basement. Temple Court is opposite the post office, on Dearborn street. Buckley has been in very uncomfortable and dingy rooms heretofore, and will show up to better advantage in the future.

The Slattery system of lighting will be used in the Temple Court building, comprising both arc and incandescent lights. The plant will include 450 to 500 of the latter.

Leonard & Izard will leave the Edison roof tree and establish themselves at No. 425, The Rookery, about the 1st of April, and the United States Company will remove from their present quarters into the same building, May 1st.

No franchises have been granted in Chicago to new telephone companies, although strenous efforts are still being made in that direction. One of the principal officers of the Inter-State Company, appeared before the Committee on Fire and Water the other day, and pressed the claims of his company. His ardor received quite a check, however, when an affidavit was received and read, substantiating the fact that on February 27, a judgment was rendered in the Superior Court against the Inter-State Telephone Company for $5,000, for wages and expenses of employes, and that this amount was still unpaid, and the committee objected to granting franchises to irresponsible corporations to tear up the streets. The company will now go to the Council direct. C. C. H.

Chicago, March 19, 1888.

OUR BOSTON LETTER.

(Special Correspondence.)

Boston must have rapid transit. That seems settled, and now the question as to how this is to be accomplished is taking up a large share of the time and attention of both legislature and board of aldermen. The hearings of the various petitioners have been continued during the past week. The Riley system was championed on Tuesday by Jonathan Dwight, of New York, and the Meigs system was also discussed. The Hinckley petition was taken up again on Thursday. The aldermen gave a public hearing on Monday afternoon on the petition of the West End Company to establish and maintain the cable system throughout the city.

The aldermanic committee on underground wires, to whom was referred the petition of Henry E. Cobb, Royal M. Pulsifer, and Francis R. Chapman, for leave to construct and maintain pipes and conduits for underground electric wires, after several hearings, reported favorably, but the full board voted to refer the matter to the corporation counsel to obtain his opinion on the legality of the order.

A bill from the legislative committee on mercantile affairs incorporates Chester Snow and two others as the Postal Automatic Telegraph and Construction Company, to contract with the national government to construct telegraphs to be worked by automatic telegraphy in connection with the post-office department. The capital is $10,000, with power to increase to $5,000,000, and to issue bonds equal to the paid up stock.

At the regular monthly meeting of the Electric Club several new members were elected, and Francis Blake, A. V. Abbott, and President Francis A. Walker, of the Institute of Technology, were made honorary members. The next dinner of the club will probably be given on Monday, March 26, at the Thorndike, when Mr. Thomas D. Lockwood, a recently elected member, will read a paper on "The Inevitable Anticipation."

Mr. George Shepard Page, the gas engineer, of New York, entertained a large audience at the club rooms, Tuesday evening, at his talk on the "Combination of Gas and Electric Light Interests." Mr. Page showed many specimens of the coal tar products and made the point that were gas to be entirely superseded by electricity for lighting and other purposes, the use of and amount of money in the further manufacture of residual products of gas making would necessitate a continuance of the process. Mr. Page also pointed out many outside uses of gas where it is supplanting steam, etc.

Among the recent orders of the Thomson-Houston Electric Company are the following: Atlanta, Ga., 100 arc lights; Adelphi, Ind., 50 arc lights; Bridgeport, Conn., 800 incandescent lights; Buffalo, N. Y., 120 arc lights; Columbus, Ohio, 100 arc lights; Colorado Springs, Col., 50 arc lights; Gardner, Mass., 50 arc and 500 incandescent lights, alternating system; Duluth, Minn., 35 arc lights; Hudson, N. Y., 500 incandescent lights, alternating system; Portsmouth, N. H., 500 incandescent lights, alternating system; Hartford, Conn., 800 incandescent lights, alternating system.

The long-distance telephone has come into sudden notoriety with the general public during the past week. It has been our only connecting link with the outside world, and instead of the familiar "By Telegraph" at the heads of important news dispatches, has appeared the less familiar one "By Long-Distance Telephone." Connection can now be made with Philadelphia, 355 miles away, and a five minutes conversation had with that city for the comparatively moderate sum of three dollars. The cost to New York is two dollars for the same length of time. The Philadelphia line is at present the longest telephone line in the world.

The underground electric conduit question has been having a most thorough airing before the city council during the last few days. Mr. E. P. Nettleton, the corporation counsel, to whom the bill granting a franchise to Henry E. Cobb and others, was referred for an opinion on the authority of the board to grant such an exclusive privilege, sent in a lengthy report, unfavorable to the petitioners. At the Monday meeting of the board, affidavits were read from G. S. Hale of the Western Union; Thomas Sherwin of the N. E. Tel. and Tel. Company; Prof. Charles R. Cross of the Institute of Technology; Thomas D. Lockwood of the Bell Telephone Company, and from the citizens' association, all setting forth the difficulties which would be encountered were the petition granted, and asking for a public hearing. Accordingly a public hearing was given on Friday evening. Mr. Powers, the counsel for the petitioners, opened the case in an able manner. Mr. Pulsifer, one of the petitioners, also urged their claim. Messrs. Olmstead, Blodgett and Winn spoke in favor of what is known as the Spaulding Solid System. Messrs. Hale and Larish of the Western Union thought it would be extremly unfair to oblige that company to lay its wires in the conduit of a practically hostile organization.

Mr. C. J. H. Woodbury appeared as the representative of the Boston Fire Underwriters' Union to protest against so much of the petition as represents placing arc wires under ground. He made the point that the electric light wires inducted the other wires in the conduit, it was impossible to insulate the wires, which, through atmospheric conditions, became liable to diffusion of electricity.

Other speakers were Messrs. Gooch, Jenks and C. L. Edgar, of the Edison Company.

The Electric Club will give its next monthly dinner at the Thorndike on Monday the 26th, when Thomas D. Lockwood, chief of the electrical and patent department of the American Bell Telephone Company, on "The Inevitable Anticipation." A new feature is soon to be introduced at the club rooms. This will consist of a modest buffet, whereat members may obtain refreshment for themselves and friends.

The Consolidated Railway Telegraph Company of New York, will give an exhibition of inductive telegraphy from moving trains as at present in operation on the Lehigh Valley Railroad, with special reference to its application in train despatching at the United States Hotel, on Monday, March 26. A despatch received by Mr. T. H. Knox, the Boston representative of the company, on Saturday, speaks of the splendid results attained by this system on the Lehigh road during last week's storm.

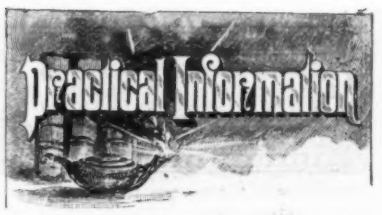
The Jarvis Engineering Co., Boston, have received the order from the New Bedford Manufacturing Co. for an eighty horse-power Armington & Sim's engine.

The Thomson-Houston Company has issued a very complete little book, bound in Russia leather, showing the total number of companies in the United States using its systems, both arc and incandescent, and also showing in tabular form the steady increase during the last few years by six months intervals. The showing is very creditable to the company, and the facts and figures are very useful to those interested in the subject.

The Baxter Motor agency has installed various sizes of their motors in Boston and vicinity, as follows: Lyman and Rhodes, one-half horse-power; Meyer's establishment, on Chauncy street, one-half horse-power for running sewing machines; another of the same size for a Washington street printing office; a four horse-power motor for grinding glass, two horse-power for shoe machinery in Providence, one horse-power for a coffee mill in Amesbury, another of the same size for the same purpose in Gardiner, Me., where a public exhibition is being made; and a small one-tenth horse-power motor has been put in on State street, for running a ventilating fan. T. W. S.

Boston, March 12, 1888.

All inventors will now take heart.



The Radio Micrometer.—This instrument is an extremely delicate form of thermopile, consisting of a square frame made of one turn of one square centimeter, of which three sides are thin copper wire, and the fourth is a compound bar of antimony and bismuth, each piece being 5 x 5 x ¼ mm., soldered edge to edge. This frame is supported by a thin rod, to which is fastened a mirror, and the whole is hung by a torsion fibre, so that the frame is in the field produced by a powerful magnet with suitable pole-pieces. When radiant energy falls on the centre of the bar the frame is deflected, and the amount of the deflection measures the energy. Adopting suitable dimensions and using a very strong field, an instrument may be made capable of showing a change of temperature of the junction of one thousand-millionth of a degree of heat.

Development of Voltaic Electricity by Atmospheric Oxidation.—When a plate of copper is immersed in ammonia solution, the oxygen of the air is gradually dissolved in the solution and finds its way to the copper plate, with which it unites, the liquid becoming blue. This action may be considerably accelerated by the use of what the author calls an aeration plate, the arrangement constituting really a galvanic cell. The copper plate is entirely immersed in the ammonia solution, and is connected by a wire to a plate of platinum or to a layer of spongy platinum, which is on the surface of the liquid. The platinum condenses the gases of the atmosphere, and from its surface the oxygen makes its way to the copper, a current being set up in the circuit. With spongy platinum and a rather concentrated ammoniacal solution the E. M. F. of the couple was found to be 0.8 volt. Experiments are in progress on other metals which may be substituted for the platinum.

Abstract of the Decision in the Famous Telephone Cases.

The decision of the United States Supreme Court in the telephone cases was announced last Monday by Judge Blatchford, and is in favor of the Bell Telephone Company on all points, and in all of the cases.

Judge Bradley read an opinion dissenting from the decision of the court. Judges Field and Harlan also dissent, and Judges Gray and Lamar did not sit in the case. The Bell patents, are, therefore, sustained by a majority of one, the court standing four to three.

In considering the question of the alleged anticipation of Bell's invention by the telephone of Reis, in Germany, the court holds that Reis discovered a means of transmitting musical tones, and nothing more. Bell's patent, being for the process or art of transmitting speech, would have been just as valid even if he had used the apparatus of Reis in developing it.

The Court holds that the apparatus of Reis was not successful in transmitting speech, and that his invention was not in any respect an anticipation of the discovery which was made by Bell.

The Court holds that the force of the testimony showing that Drawbaugh had telephones in use before the invention of Bell is completely broken by his own conduct and the indifference which he manifested with regard to his alleged invention until years after Bell's telephones were known to the whole world. The Drawbaugh claim is declared to be unsustained.

The decision reviews the charge of fraud and collusion in the Patent Office, by means of which Bell, it is alleged, obtained surreptitious information with regard to the inventions of his rivals, and then amended his own specifications. The Court holds that there is not the slightest evidence to support this charge or to cast the least reflection upon the integrity of Bell or his attorneys.

The dissent of Judges Bradley, Field and Harlan is based upon the Drawbaugh claim. They are of opinion that the evidence overwhelmingly shows that Drawbaugh was the first inventor of the speaking telephone, although he was unconscious of it, and was not aware of its importance.

TELEGRAPHIC

... Mobile, Ala., wants proposals for fire alarm telegraph system. Address J. F. Summersell, city clerk.

.... The wires of the Union Electric Fire Alarm Company, at Altoona, Pa., have been cut in out-of-way places, boxes defaced, and key holes plugged. A reward of $250 is offered by the Union Company for the arrest of the miscreants.

.... Repairs of telegraph wires were prosecuted with vigor after the blizzard as soon as there were trains to transport the linemen. One mysterious feature of the trouble with the New England circuits was discovered near Williamsbridge, where 40 poles had been sawed off just below the cross-arms. What the purpose of this was is yet to be determined, but the thing was made easy of accomplishment by drifts twenty feet high that formed there. There were places in the cuts between Mott Haven and Spuyten Duyvil where the wires were actually buried under the snow.

.... It is expected that work on the new police telegraph system that has been adopted by the police commissioners will be begun within a few days, and in a short time several of the down-town precincts will be completely equipped. The system chosen is the Herzog teleseme, which provides a great variety of special signals most likely to be used in the police service. Every patrolman will carry a key, and boxes will be plentifully scattered over the precincts. The sum of $100,000 that has been already appropriated will, however, suffice for only a small section of the city. The annexed district is already supplied with a system somewhat similar.

.... The monkeys which inhabit the jungles and chaparrals of Tobasco, in Mexico, are formidable antagonists to the construction of telegraph lines. They are very numerous and their favorite diversion is to climb the telegraph poles and go through gymnastic exercises on the wires. Linemen assert that often a hundred able-bodied monkeys may be seen swinging on the wire, festooned monkey fashion, by looping their tails. The continuous vibrations of these forest gymnastics start the iron nails used on the cross-arms, and these often come down, bringing the wire with them. And it is not a safe matter to undertake to disperse these robust monkeys who play the dickens with the telegraph lines in the sparsely inhabited State of Tobasco. Linemen have found that on shooting a monkey swinging on the wire they have been pursued by a whole regiment of the annoying little beasts.

.... A suit was begun last week in the United States Circuit Court by the United States Government against the Western Union Telegraph Company and the Union Pacific Railroad Company. The suit is brought to recover $12,495.45, which it is claimed is due to the government under the following circumstances:

When certain grants of land and other privileges were made by the government to the various railroads now known as the Union Pacific, it was provided that all telegraph messages for the government should be charged at a rate that should not exceed that charged to a private individual.

It was further provided that all the money thus received should be paid to the United States Government, one-half of which was to be applied to the payment of interest on the bonds and the other half to form a sinking fund to take up the bonds.

The Western Union Telegraph Company built a line between Council Bluffs and Ogden, and from the year 1881 the returns of both enterprises were equally divided between the Western Union Telegraph Company and the Union Pacific Railroad. About $12,000 have been received since that time in payments by the government for telegraph work and has been held in about equal proportions, it is contended, by the companies and not paid over to the government.

How the Telegraph Key is Held.

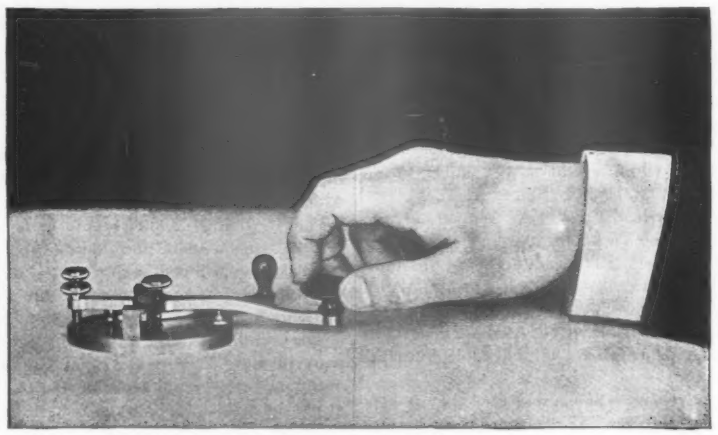
"The Philosophy and Practice of Morse Telegraphy," is the title of a new work by Prof. T. Jarrard Smith, published by the E. S. Greeley & Co., New York. In this work a new feature is developed relating to the method of holding the key, as shown in the illustration herewith.

Apart from the exceeding technical interest that an exposition of the true position of the telegrapher's hand in the act of writing on the telegraph key, may have for the fraternity, owing to the wide spread of and general interest in the occupation of telegraphy, a pertinent fact of this kind, exploding an old and accepted, though erroneous conclusion, cannot fail to command some attention.

The error, with regard to the position of the operator's hand, has been industriously disseminated for a number of years in books of instruction on the subject by various authorities, and up to this time has passed unchallenged.

The truth, exposed by a lightning wink of the instantaneous camera, and permanently fixed for our deliberate inspection by the science of photography, dawns upon the craft intellect accompanied with something of the amazement that startled the artistic world when the elaborate anatomical studies of Rosa Bonheur of the horse in the act of running, were delivered over to universal ridicule by the subtleties of the same agent, instantaneous photography.

An examination of the position submitted will show that in the one presented, the hand



How to Hold a Telegraph Key.

and wrist, together with the fore arm, form a comparatively straight line direct from the knuckle backwards, while in the old idea the hand is humped up like a camel's back, throwing the wrist into the position of a valley, the mountains on either side being represented by the knuckles and the fore arm respectively.

Now that the subject is illumined with the light of truth, the disadvantage and even absurdity of the old representation, says the author, is at once made apparent. The bones of the hand and fore arm meeting at the wrist at the angle depicted, rob the jointure of all flexibility and demonstrate it to be, under analysis, not only an erroneous, but a practically impossible position.

Across the Ocean and Back Again to Carry News between New York and Boston.

The *Evening Sun*, of New York, published the following editorial, March 14, which is of particular interest, as indicating the resources of the telegraph system of the world in an emergency like that brought about by the terrible storm of last week:

"A despatch from Boston travelled six thousand miles to reach the *Evening Sun* office. There were no land wires standing yesterday about New York, and, indeed, nothing was secure from the paralyzing effects of the great storm except the Atlantic cables in their ocean depths. Thus it came about that the *Sun* and its associate journals of Chicago, Pittsburgh and St. Louis acquired news of what was transpiring in secluded Boston by way of Great Britain, while Boston in turn printed this morning in the esteemed *Herald* of that city the news of New York telegraphed thither from the *Sun* office by way of London and Newfoundland!

"What queer days these be that we are fallen upon, when we drive 6,000 miles or more for the news that is almost at our doors, and project it by the lightning through sterile Rockport and bleaker Canso to the Land's End and London, and thence back again by Coney Island to imprisoned New York!

"It only goes to show what the telegraph can do, just as the last two days have shown what without it we cannot do. Snow and storm did not stop the Stock Exchange or all the other exchanges. Isolation did it. The telegraph has made the Stock Exchange an essential part of a wonderfully co-ordinated whole, and the entire business anatomy of the country acts upon a common circulation and a common vitality. Any one part that is cut off from the common system must discontinue its functions, and New York will suffer from commercial paralysis whenever its telegraphs are destroyed.

"The *Evening Sun* doesn't look as if it suffered from any visible paralysis, but all the same it is great fun getting news from Boston by way of her Britannic Majesty's insular properties.

"The following letter, which was received at the *Sun* office last night from the Commercial Cable Company, explains itself:

"DEAR SIR—We are pleased to inform you that the *Sun's* despatch for the *Herald*, via London, was received in Boston at 11.39 P. M. It was forwarded from this office at 10.44 P. M. This is speed! Respectfully, THE COMMERCIAL CABLE COMPANY.

"Great is the Commercial Cable Company, and we take this occasion of testifying to the generous and liberal spirit of its administration. If its managers owned the whole *Sun* office they could not have shown more enterprise or enthusiasm in securing the delivery of our despatches under circumstances of extraordinary difficulty."

Death of Mr. Marks.

Mr. W. Willoughby Marks, superintendent of the Bishop Gutta Percha Company, of this city, died Friday March 9, of heart difficulty, after having been confined to his home about two weeks. The REVIEW sincerely deplores the death of Mr. Marks, who was a very efficient and original electrical worker, and whose genial manner had won him a very large list of friends. It was only a few weeks since that the REVIEW contained an account of his honorable career and long service in the manufacture of gutta percha goods.

Capt. W. Walcott Marks, who has for many years assisted his father, will assume the duties of the superintendency of the factory of the Bishop Gutta Percha Company.

.... In a recent telegraph case, Col. Ingersoll alluded to his adversaries as "lolling around the hole in the ground in which my client was digging, and when his spade unearthed the precious ore, they all with one accord jumped in upon him and attempted to rob him of the fruits of his toil." At this point, his client, Edward Stokes, plucked the Colonel's sleeve and whispered in his ear. With a genial grin, Mr. Ingersoll turned to the court, saying, "Please, your Honor, my client says that my metaphor is beautiful and true except in so far as it represents him as finding anything valuable in the hole!" "Mortgage these wires!" he exclaimed at another point, "Why, you might as well talk of mortgaging the track left by the flight of a flock of geese through the air!"

How They Do It In England.

TO THE EDITOR OF ELECTRICAL REVIEW:

Quite an interesting tableau is presented to the quiet observer on a careful perusal of the proceedings of the English Society of Telegraph Engineers, at their meeting of February 9, 1888. It might be called the "Battle of the Titans" in one respect, and yet it was a bloodless war, except for the gory tint which, in the writer's imagination, must for days after have hung around the optics of the contestants.

First, Mr. Knapp, a high electrical authority and cup bearer to the amber god, stood up loaded to the muzzle with core and shell transformers, whose differences and peculiarities he discussed in his usual forcible and logical methods. He told of the idiosyncrasies of the healthy adult transformer: and he gradually warmed up to the task of tackling the diseases, such as "static hysteresis," and "viscous hysteresis," and "dissipated energy," and magnetic resistance to good behavior, etc. Altogether his paper was most interesting.

Mr. Knapp does not commit himself irrevocably to the transformer system, and he especially condemns the series plan as impracticable. He stands, as it were, with one foot in direct current territory, the other in the field of transformers, and reaches for safety fuses with both hands.

Next we hear from Mr. Mackenzie, also a great electrical authority in England. He goes into the same subject as his predecessor, and commits himself to several point blank propositions, among them the following: The multiple system of alternating current transformers is the only practicable system of electrical distribution in its true sense; the employment in a big central station of a few very large dynamos instead of a large number of smaller ones is a mistake and a waste of good material; the introduction of transformers in the general distribution of electrical energy is the longest step forward made since the Paris Exhibition of 1887.

Next comes our old acquaintance, Professor Aryton, the renowned maker of mysterious ammeters, voltmeters, ohmmeters and a whole tribe of other meters, including everything but a common-sense meter, capable of being taken apart, repaired and reliably calibrated by the owner. By the way, what a luscious verbal morsel "calibrate" is to the electrical "smart Aleck," and how he loves to use it "trippingly o'er the tongue!" After a few flattering comments on the previous speakers, our instrumental prodigy takes a long breath and then dives into his favorite element, electrical measurement as applied to transformers. No use trying to measure the power given to a transformer by using quadrant electrometers and voltmeters, because of the self-induction of the primary and the mutual induction of the primary and secondary. He "has been there," and he details his most interesting experiences. He wanders anxiously through the dark wilderness of instrumentation with the light of criticism, like Diogenes with his candle looking for an honest meter. True to his instinct he *finds* it (Invenio: I come upon, I *invent*), and how beautifully simple and English it is, to be sure. We merely have to take down our transformers, and with their self-sustained heat boil some water, and after a wrestle with insulation, thermometers, calorimeters, chronometers and vexation of spirit, we can cry out, *Eureka!* All very well for the purpose, perhaps, but rather hard on the transformer—too much like the urchin dismembering his speaking toy to find where the squeak comes from.

Our quondam citizen, Mr. Bernstein, next rises majestically to the occasion, and as he is wedded to his hobby of series lighting, he must perforce hold out for transformers in series, and he therefore tries to sit down hard on Mr. Mackenzie, and to figuratively smash the arguments favoring multiple distribution, finally endeavoring to show how the whole science of applied electricity depended on his omnipotent "contact plug," which, after a little "taffy" from Mr. Preece, Mr. B. condescends (?) to describe (anglice, advertize). According to Mr. B. we must

use transformers in series because, forsooth, he has developed a complete system of series distribution for incandescent lighting. He cuts his cloth according to his coat.

Then, after a few scattering observations by eminent members of the society, the adjournment being at hand, Mr. Crompton fiercely satirizes the previous remarks of the various speakers, and notifies them that his gun, too, is loaded, and at the next meeting he proposes to demolish them with their transformers and blackboard mathematics, from a purely commercial standpoint. At the reconvening of the society, the adjourned disussion was taken up, and the wreckers began their work. Mr. J. E. H. Gordon, the hitherto great champion of alternating current direct distribution, thought it a great pity to see so much ingenuity lavished on that *ignis fatuus* of the electrical engineer—the transformer system—which, it is true, is of great scientific interest, but of no practical value, only intended for a makeshift, etc. He abandons his cherished theory about direct distribution and comes out strongly in favor of distribution by storage batteries. Why? Because it does not pay to run a 20,000 light dynamo for 24 hours, when the whole number of lights is called for only during a few hours, say 4 to 10 P. M. It's bad for the coal-pile. Certainly, Mr. Gordon, but the conclusion does not form a necessary sequence, that storage is the *summum bonum*. The arguments against 5000 h. p. quadruple expansion engines are good, but why use them? Under Mr. Church's plan of lamp-hour-proportioned engines and dynamos, the argument fails.

Finally, the great Crompton begins his work of demolition. With true British superciliousness he ridicules everything that everybody else asserts, runs down their efforts and results, and insists that they have a little to learn still in the way of electric lighting. He has "carried out several central stations," *ergo* he knows it all. Such egotism is only equalled by the taste displayed in the following remarks:

"But let me tell you that what Mr. Westinghouse has done for the transformer system is exactly what Mr. Brush did for arc lighting, when we saw him send over to England from his well-appointed factory a few years ago, complete sets of excellent machinery, and which he now sends to any town in America requiring the electric light of the sort. This machinery can be put up on the spot at a small cost. Anybody who has been to America, and knows anything about American installations, will corroborate me in saying that the electric light machinery as made in the shop is perfection, but the putting up of it is such as would not pass muster in the worst of our English installations. That has been the case with the transformers set up by Mr. Westinghouse, and though perfectly suitable for such countries as America and Australia, where rough workmanship and rough things do, they are quite unsuitable for a civilized town."

Therefore, while the machinery (dynamos, transformers, etc.), "as made in the shop, is perfection," yet Mr. Crompton's logic leads him to the conclusion that the alternating current transformers are not, cannot be run in parallel. Perhaps he could learn a thing or two by coming to the United States. Pittsburgh, for instance, has over 20,000 lights operated successfully from one station with alternating currents and transformers in multiple arc; but then in Mr. C's estimation, Pittsburgh is not a "civilized town." What a pity he has not a tutor to teach him a little common sense.

Contrast with this the remarks of Prof. Forbes, a no less distinguished electrician fresh from England, as he spoke at the recent Electric Light Convention at Pittsburgh: "At every step, as I go through different cities, I see how enormously ahead you are, over us in England."

But in all this there is a lesson for Americans. For years most of the scientific text books have emanated from abroad. In the literature of electric lighting, we have largely been accustomed to depend upon the supposed superior erudition of our English cousins, and to accept their theories, elucidations and conclusions as final and correct. But the spectacle of inconsistency, recrimination and disagreement in vital questions, presented at the last meeting of the Society of Telegraph Engineers and Electricians, shatters our idol and opens our eyes to the species of idolatry we have been practising. After all, though we have read their books, studied their theories, and some of us have been mislead by their conclusions, if our work is summed up for judgment, it must be said we are ahead. Our American electrician gets an idea, and he does not sit down for a week's wrestling match with sines and cosines, hyperbolic logarithms or other mathematical sinuosities, but *goes to work* and reduces the idea to practical form, and thus makes more progress in one week than his English contemporary will in a year. Nor do our best electrical engineers waste their time in useless discussions in the domain of exalted mathematics as to whether or not such and such results can be accomplished by a formula with a "constant" tacked to its tail, compelling a year's work to find the constant. They get there sooner with a footrule and T-square, but they "get there just the same." OBSERVER.

New York, March 15.

A Gentle Complaint from a Pretty Operatoress.

Said a pretty telegrapher: "I wish you could tell me why it is that the young man who sits next me gets $80 a month, and I get only $50, when I do three times as much work as he does. You see, our despatches are numbered, and there have been times when I have had 320 a day against his 60. I work steady, and he is resting every half hour. At any rate, I've often begged him to change wires with me, and he won't.

"There must be some good reason. Perhaps it is because he can do night work?"

"If he does he is paid 45 cents an hour for overtime. I'd do it gladly for that. I am an expert as much as he is an expert. No; they say it is because men have families to support. But so do I have a family to support. I don't blame the man, you know. I don't want to drag him down to my level. I want to raise myself to his."

"Perhaps women are not desired in telegraph offices?"

"Yes they are if they are experts. But it is getting very difficult to become an expert. You see the first few years you are not very capable, and nobody wants you. But without practice you can't become an expert. One of the first rules of an organization is to hinder students wherever you find them. There is injustice again. Now, personally, I am sure I have no such feeling against the girls, but it seems we must do that for self protection."

"But doesn't the organization help you who are members in sustaining your wages?"

"No; when it becomes a matter of business the women are voted down every time. I have thought about this a great deal, and I don't see any way out. Tell me. I am almost afraid to ask it. Do you suppose the ballot would help us? For sometimes I have thought that may be the fact that the young man who sits beside me has a vote gave him more pay for less work than I do. Now, do tell me just what you think?"

Steamboat Telephones.

The Delaware and Schuylkill River police tugs William S. Stokley and Samuel G. King now have telephonic connection with police headquarters at Fifth and Chestnut streets, Philadelphia, and the rooms of the fire alarm in the new public buildings. This novel piece of work was accomplished under the direction of Chief Walker, of the Electrical Bureau, and the two boats can receive their orders at a moment's notice. The wires which connect the boats run under ground along Chestnut street from river to river, and then along the wharves until the piers at which the two boats lay are reached, when connection is made. At the piers the wires are incased in a rubber tubing, which ends in a plug. The wires on the boats are similarly protected, and when a boat makes fast to the wharf the two plugs are connected, which completes the circuit. Should the boats be ordered into the river for service the rubber-covered wire with the "plug" at the end is simply hung up on a hook on the wharf until the return of the boat, when the "plug" is once more put in place, and communication again opened.

Electric slaughtering of cattle has proven successful in St. Petersburg, death being instantaneous.

Electric Notes of the Great Storm.

Never in its history, at least since the telegraph was invented, has New York experienced such a storm as arrived last week. For three days, Monday, Tuesday and Wednesday, all business was prostrated, and travel and communication of all kind were brought to a sudden and severe halt. Of course, such a heavy fall of snow, preceded by rain and sleet and accompanied by a powerful wind, caused sad havoc among the aerial wires of the city, as well as breaking down all the leading lines extending out of New York. At one time the long-distance telephone was the only means of communication between New York and Philadelphia, all trains having been snowbound, and positive instructions issued by the Pennsylvania Company not to sell any tickets. This never occurred before, we believe, in the history of this great corporation. Between here and Boston, even the splendid construction of the long-distance telephone company was not equal to the great strain, and at one point, just outside of New York, where a number of large poles had been put up necessarily in an exposed place, they were broken down, and the business over the Boston lines entirely cut off.

In the city, many of the electric light circuits had to be cut off, and telephonic and telegraphic communications were slow and uncertain. In many places the wires were broken down, and lay in the snow-drifts in an inextricable tangle.

Monday and Tuesday but little repairing could be done, but on Wednesday large gangs of experienced linemen started, and the work of repairing and remedying the disastrous work of the storm was soon fairly under way.

Superintendent Reilley, of the Brooklyn Company, was snowbound at Lakewood, N. J., just at a time that he knew his services, if ever needed, were needed then. For two days he was the maddest man in two States.

A number of telephone men who had planned a Florida trip last week decided that there was fun and recreation enough at home for several days.

The demand for underground wires in New York is louder and more urgent than ever. Likewise, for an underground railway, as the surface cars all stopped, and the trips of the elevated were few and at very long intervals.

It is difficult to estimate the loss to the electrical companies, but in the matter of repairs alone the damage in New York and Brooklyn must amount to many thousands of dollars. Nearly one-half of the New York system was broken down, and about the same proportion in Brooklyn.

The reporters of the daily press of New York were equal to the emergency. They fought their way heroically to their offices, each one gathering enough "notes of travel" while *en route* to aid in making interesting the issues of their various journals. As there was no telegraphic news of consequence, New Yorkers were privileged to read papers almost entirely filled with local occurences, in which incidents and features of the great storm formed the body part. The enterprising newsboys who reached suburban points with the daily papers, easily sold them at ten and twenty-five cents a piece.

On 11th street, from 7th avenue to Greenwich street, the entire pole line, nearly a mile in length, was broken down, the poles falling against the houses.

The new splendidly constructed line of the Metropolitan Company on Tenth avenue, was broken down for a length of two miles.

The loss to the Metropolitan Company, it is estimated, will easily foot up $100,000.

His Rheumatism acted as a Ground for the Telegraph Wire.

One of the telegraph lines on the Wabash road, known as number four, has been a source of mystery to the operators for some time. It had spasms of going and stopping, and "old climbers" has been unable to locate the trouble, until quite recently. He finally chased it down to where an old man had led a wire into his house near Wabash, Ind., and was applying electricity for the cure of rheumatism.

Telephonic News

*** The brave and skillful linemen were appreciated in this city last week.

*** Sweet peace has not as yet settled down over the Rochester telephone situation.

*** The damage by the storm last week to telephone and telegraph wires outside of New York City and immediate vicinity was not great, but in the city—whew!

*** Mr. McLaughlin has introduced a bill in the Assembly fixing telephone charges in New York and Brooklyn at not over $6 per month. It was referred to the Cities Committee.

*** The long-distance telephone came nobly to the rescue during the great storm. The railroad officials in Philadelphia and New York made valuable use of these instruments.

*** Washington was a great sufferer telephonically from the storm of last week. A great many wires were broken down. Telegraph, electric light and fire alarm wires also suffered a great deal.

*** In the worst of the blizzard, New York was dependent for the transportation of persons and the transmission of intelligence solely upon three things that were not known here a dozen years ago—the elevated railroads, the Brooklyn bridge and the telephone.—*N. Y. Sun.*

*** The long-distance telephone was the only means of communication between New York and Philadelphia for twenty-four hours during the great storm of last week. This shows that it pays to do a thing well. There never was better telegraph or telephone line construction than that by the long-distance company.

*** The Massachusetts Legislature is not at all likely to pass any law this session regulating telephone charges. There is a bill in the hands of the committee covering this point, but no earnest effort is being made to forward it as was the case last year. The New England Telephone Company is, therefore, probably safe from attack this season.

*** It is reported in Boston that the Bell Telephone counsel have been notified to appear at the opening of the Supreme Court, the inference being that a decision will be announced at that time in the telephone cases. The rumor is that the decision will not be a straight-out one and will not be entirely satisfactory to either side. Bell Telephone was bid up last week to 229, closing at 226.

*** A telephone receiver has been patented by Mr. Alonzo W. Brown, of Evanston, Wyoming Ter. A box is secured between the poles of a permanent magnet, and in the extremities of the magnet are threaded holes, into which are screwed inwardly extending polar extensions, the usual diaphragm being replaced by a tongue arranged to vibrate between these extensions in unison with the vibrations of the current.

*** The great snow storm last week almost demoralized the telephone service in New York and Brooklyn. The old construction in East Brooklyn gave out early, and wires and some poles were scattered indiscriminately about in the snow banks. The Brooklyn operators were well cared for by the company, many of them being housed at the hotels near the main exchange, the snow preventing their return home with any safety.

*** New York City, we venture to say, has the best-natured and most tactful staff of telephone operators in the world. During the great storm, with all its exasperations and unlooked for annoyances, the young lady operators were always accommodating, endeavoring in every way to aid the subscriber in securing answers to his calls. And in this respect the John street exchange is entitled to the highest credit. Manager Lockwood and his gentle-voiced staff may well be proud of their excellent work during and following the blizzard.

ELECTRIC LIGHT NEWS

—— Urbana, O., wants proposals for electric lights, arc and incandescent, to be operated five years. Address O. Starr, city clerk.

—— The consolidation of the New Bedford Electric Lighting Co. with the New Bedford Gaslight Co. has been formally consummated.

—— The Millville-Schuyler (Millville, N. J.) Electric Light Company succeeded in repairing the break in its wires, caused by the storm, and on Tuesday night the lights were shining brightly.

—— The Thomson-Houston International Company will have exhibits at the International Exhibition in Glasgow and at the Italian Exhibition in London. The latter is to be lighted with 320 T. H. arc lights.

—— The second annual ball of the employees of the Citizens' Electric Illuminating Company, Brooklyn, will be held Easter Monday, April 2. The proceeds of the ball go to a relief fund created by the employees. The first of these was quite a success, and no doubt this one will be.

—— The Cape May election resulted in a triumph for the friends of the electric lights. Frank Shaw, Francis K. Duke and John Atkin were elected Councilmen. James E Taylor, of the Electric Light Company, was elected Collector, and I. H. Smith was re-elected Treasurer, March 13, 1888.

—— The public streets of Salida, Col., were lighted last week for the first time with the electric light. The complete success of the first venture is an evidence of the skill of the linemen in the employ of the company. They are justly proud of the electric light plant, and visitors say it is one of the best in the State.

—— Mr. H. E. W. Palmer, of Atlanta, Ga., formerly private secretary of Gov. McDaniel, has taken the State agency of the Thomson-Houston Company. Mr. Palmer is a man of excellent standing, widely known in his State and will no doubt make a very successful representative of this enterprising company.

—— The Westinghouse Electric Company has just completed an incandescent lamp which is expected to give better results than any lamp now in use. Formerly a lamp which burned 800 hours was considered good; but the new one is expected to burn easily from 2,500 to 3,000 hours without discoloration. Discoloration has been a stumbling block in the way of incandescent lamps ever since they were invented.

—— The Philadelphia agent of the American Electric M'f'g Co. has just closed a contract with the Merchants Electric Light Co. of North Front street, Philadelphia, for a fifty arc light machine and lamps of the American system; he has also sold an additional fifty light dynamo with double carbon lamps to the Wissahickon Electric Light Co. This company recently received a contract for lighting the river drive in Fairmount Park, through the Park Commission of Philadelphia.

—— Among the incidents of the storm in Boston may be noted the entanglement of a horse attached to one of L. G. Burnham's coal delivery teams in the prostrated wires. It was in the evening. The horse got entangled and the wires threw him down. Some of the snarl of wires proved to be those of electric lights. The kicking and the struggles of the horse brought the wires in contact, and in the words of the teamster: "Every time he kicked it would lighten, and every time it lightened he would kick! I thought to myself, 'he is bewitched with lightning.' I tried to unbutton him, and every time I unbuttoned one place he was struck with lightning in another." The poor horse was finally released from his peril by somebody who understood the cause of the trouble.

Electric Club Notes.

TICKETS NOMINATED FOR THE ENSUING YEAR—NEW MEMBERS—INCIDENTAL NOTES, ETC.

The annual meeting is announced for April 19th, at the Club House on 22d street. The election of officers for the year, beginning May 1st, will be held that day.

The Executive Committee of the National Electric Light Association makes its headquarters and receives its mail at the Electric Club.

Several of the out-of-town members were storm-bound at the Electric Club Monday and Tuesday of last week. They found the Club a pleasant place to be during the heavy storm. Among the number were Chas. Selden, of Baltimore, and Col. Geo. L. Beetle, of Chicago.

Mr. F. G. Waterhouse, one of the Club's Hartford members, was a New York visitor last week. The Waterhouse factory he reports crowded with business.

Among the recent subscribers to the Club bonds was Mr. Alfred F. Moore, of Philadelphia, who evidenced his interest in the success of the organization by taking a generous number.

Mr. Theo. N. Vail takes quite an interest in the Electric Club, and is one of its most public-spirited members. He heads the list as member of the new Board of Managers, nominated at the meeting held Thursday, March 15.

There are over thirty new members who have been passed upon favorably by the Committee on Membership, and who will be acted upon by the Board Thursday. Owing to the nominating meeting, the last Board meeting was adjourned one week.

R. T. McDonald came out of the West last week, and met a number of Eastern friends at the Electric Club. He, with Mr. Marmaduke Slattery and J. E. Talbot, left for Chicago last Sunday, where the second named gentleman addressed the Western electricians Monday evening.

R. F. Ross, secretary of the Boston Electric Club, started out gaily from Boston for New York the first of last week. He arrived Saturday morning by boat from New Haven, having had enough experience crowded into the five days he had been snowbound to last for all time and be abundantly satisfactory.

There is general satisfaction over the renomination of President Henry C. Davis.

Thirty new members were elected this week, and twenty applicants are posted.

The monthly meetings of the Club will be resumed, it is expected, immediately after the annual meeting.

General Manager Pratt, of the Jarvis Engineering Company, now a Boston member, was in the city last Saturday. He predicts the greatest electrical year, in volume of business, for 1888 we have ever had, particularly electric lighting.

NOMINATIONS.

At a meeting of the Club, duly announced, held Thursday, March 15, the following ticket was placed in nomination as the "Regular Ticket" of the Club:

President—Henry C. Davis.
Vice-Presidents—Thos. A. Edison, Geo. W. Hebard, E. T. Gilliland, Geo. L. Beetle.
Secretary—Chas. W. Price.
Treasurer—Willard L. Candee.
Board of Managers—Theo. N. Vail, A. H. Patterson, Chas. A. Cheever, H. D. Stanley, M. W. Goodyear, Geo. B. Coggeshall, H. A. Reed, Cyrus O. Baker, Jr., Chas. Dutton, Eugene T. Lynch, Jr., Thos. L. Fowler, J. N. Keller, H. R. Garden.

The Committee on Membership of last year was nominated.

Another ticket was placed in nomination known as the "Opposition Ticket," and is as follows:

President—Henry C. Davis.
Vice-Presidents—Geo. W. Hebard, Thos. A. Edison, O. E. Madden, E. T. Gilliland.
Secretary and Treasurer—Same as regular ticket.
Board of Managers—Theo. N. Vail, Geo. B. Coggeshall, Jno. C. Tomlinson, Chas. W. Gould, Cyrus O. Baker, Jr., J. N. Keller, M. W. Goodyear, Geo. L. Beetle, A. H. Patterson, Dr. Otto A. Moses, Henry A. Reed, Henry D. Stanley, Jno. A. Seeley.

No change in Committee on Membership.

These tickets, we understand, will be printed and mailed to each member, and will be voted upon at the annual meeting to be held April 19th.

—— It is stated that the Rothschilds have acquired the French patents for the Cruto electric lamp, and will establish workshops for its manufacture.

Use of Train Telegraphy in the Blizzard.

THE EXPERIENCE OF THE LEHIGH VALLEY RAILROAD.

The New Jersey Division of the Lehigh Valley Railroad has been, if possible, more completely blocked by the late phenomenal downfall of snow than perhaps any other line running out from Jersey City, this being especially so between Perth Junction and Easton. Meagre accounts in the morning dailies have mentioned a severe accident that occurred on Wednesday, at 4 P. M., on this division of the L. V. R R., near the station of Three Bridges, as the result of which the lives of four men were lost and a larger number injured. The accident was caused by an engine running into a snow drift. During the storm, commencing on the line early Monday morning, the regular telegraph service lines of the L. V. R. R. became entirely inoperative, but the single steel wire, strung upon short poles, of the Induction Train Telegraph System of the Consolidated Railway Telegraph Company, now in use upon this road, remained intact and was the only line that could be used by the road between its terminal at Perth Amboy and Easton, and has been of most signal service during the week to the road for the transmission of dispatches between snowbound trains and the directing officials at Perth Amboy, as well as the only means of communication between the head officials at Bethlehem and the wrecking and relief trains sent out from time to time. Unparalleled and extraordinary opportunity for practically exemplifying the great and undeniable value of this system of communicating between trains at any point by means of the Induction Train Telegraph System of the Consolidated Railway Telegraph Company was shown at the wreck referred to above. As an operator of this company was on board of the relief or snow train upon which the wreck took place, for the purpose of communicating with the train dispatcher from time to time, he, therefore, was aboard at the occasion of the accident, and at once telegraphed the fact to Division Superintendent Donnelly, who was quickly at hand and used the train telegraph extensively for sending over medical aid and help for relieving the injured and removing the mangled bodies of those that were killed. Mr. Donnelly, as well as those in charge of the train, and in fact this entire division of the road, are most enthusiastic in their praise of induction train telegraphy, and say that "We do not see how we could have got along without it." It certainly, in this particular instance, proved itself to be, what has always been claimed for it, an indispensable aid in the management of railroads, not alone under ordinary circumstances, but also at times of emergency. The fact that while all other telegraph lines were down on this division during the storm, that this line remained entirely intact was due to the method of construction, the plan of the Consolidated Railway Telegraph Company being to use only stout wooden poles, firmly and strongly set into the ground, with no cross-arms and carrying a single wire. In this way it is scarcely possible to conceive of a storm capable of overthrowing a single line constructed in this manner. A severer test could not have been conceived of than that afforded by the late storm on the line of this road, and has fully proved all of the arguments made in behalf of the adoption of this system of communicating, at all times and in all conditions of weather, with the moving trains from the directing office of the road, independently of the use of side telegraph stations. If, as has been so clearly demonstrated during these last few days upon the Lehigh Valley, upon such a short section, the system was of value, what then would be its value upon the long stretches of single track lines of the West and Northwest, especially during their snowbound periods extending sometimes over weeks, taking for example, the Northern Pacific and Central Pacific Railroads.

A word certainly should be said, on behalf of the advanced and intelligent enterprise which has been evinced by the management of the Lehigh Valley Railroad in thus pioneering, so to speak, the way towards the use of this invaluable adjunct to modern railroad management, affording not alone a great convenience and safeguard to the management of their own lines, but also a convenience and comfort to the fortunate passengers upon this well-managed railroad.

A gentleman who started for Washington on the train late Sunday evening, stated that he and his fellow passengers were blockaded this side of Philadelphia for many long dreary hours, without any possible way of communicating with the outside world, except by the hazardous proceeding of plunging through the dangerous snow drifts for some miles. "And" said he, "as far as we could look back from the rear of the train, we could see the tall, heavy telegraph poles with their many wires, stretched upon and across the track; this also extending in both directions; and a knot of my fellow-passengers, in conversation to whom I had been explaining what train telegraphy was as I have read of it, stated, 'Why don't the railroads appreciate at once the enormous advantages of this system, and the great convenience and comfort it would be to their passengers, and also a source of profit as well to the railroad company having the sagacity, far-sight and enterprise to adopt this wonderful and yet extremely practical system of telegraphing from trains?' "Why," said again this gentleman, "almost any of us would now gladly give from one to five dollars for a chance of communicating, by means of this system, (had it been there) with our anxious friends and families."

No severer test of the entire safety and practicability of the perfect working of this system during severe storms of any description could be well afforded than that which has just occurred along the line of the Lehigh Valley. The ordinary telegraph line of this road is, if anything, better caculated to resist a severe storm than those usually upon Eastern railroads, for the reason that they do not carry a very large number of wires, nothing to be compared with those upon the lines running out from the Grand Central Depot, or on the Pennsylvania or Erie; but even this line, well constructed as it is, succumbed, as well as the rest, leaving only the Induction Train Telegraph System of the Consolidated Railway Telegraph Company.

—— An Edison central station is being established at Conception, Chili, with a capacity of 5,000 lamps.

—— The Springfield, Mass., Electric Light Company has increased its capital from $110,000 to $150,000.

—— W. & J. Whittemore, and L. S. Watson & Co., of Leicester, have put electric light into their factories.

—— At Millerburgh, O., an electric light plant will shortly be put in. The number of lights will be from 50 to 60.

—— The Ware, Mass., Electric Light Company will shortly enlarge its plant and will purchase a 50 horse-power engine, boilers and dynamos.

—— Little Rock, Ark., wants proposals for electric light plant, arc and incandescent, to be operated for two years from date of contract. W. G. Whipple, mayor.

—— The local arc lighting companies of New York only used a limited number of their circuits for two or three evenings during the heavy snow storm. Telephone, telegraph and electric light wires were so badly tangled that it was deemed best not to undertake to serve many customers until the trouble was largely remedied.

—— There are to be 1,250 lamps used in lighting Hoosac Tunnel. These are of 25 candle power each, and will be fastened to the walls by bolts. It will require about 60 miles of wire for the main lines and lamp connections. The contract calls for the completion of the work Feb. 1st, but it will require some time yet, as a number of unexpected obstacles have been encountered.

—— The Jenny Electric Light Company, of Fort Wayne, Ind., are contemplating the removal of their plant to a larger city and a better location. Louisville, among other places, is being considered. There is a vast field in the South and Southwest, which could be profitably worked. Louisville occupies to the South an attitude somewhat similar to that which Chicago holds toward the West and Northwest, and has become the most important distributing point south of the Ohio river.

The Telephone in Ohio.

THE SITUATION IN THE MATTER OF LEGISLATION ABLY PRESENTED.

A joint meeting of the Senate and House Committees of the Ohio Legislature having in charge the bills introduced by Senator Adams and Representative Clarke restricting the rentals for telephones to $2.50 and $3 per month was held last week. Senator Adams, the author of the Senate bill, was called upon to preside, and Representative Clarke was present to ask questions. The first person to address the committee on behalf of the telephone companies, and show reasons why the bill should not be passed, was Mr. A. A. Thomas, general solicitor of the Central Union Telephone Company. His speech was pointed and forcible. He said:

"The transmission of speech electrically is no older than its patent issued to Bell in March, 1876. It did not come into commercial use until four years later. The system and plants in this State are practically about eight years old. This has, in fact, been merely an experimental stage. No one knew what to do nor what apparatus were required before the old had become worn in use by new devices. The Dayton Central office has been torn out and rebuilt three times. I know the top story of the Cincinnati Exchange building was filled with such discarded new machinery. Most of the telephone apparatus and wires constructed are not now in sight. A feeling general in the community is that the capital invested in telephone business is secure; that the net profits are very large, and that the service the public receives would be as good if rates were reduced. This impression is erroneous, but it has occasioned legislative investigations in Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, Missouri, Kansas and Nebraska, and in every State except one the conclusion was come to that what these bills propose would not be just or expedient. The committee appointed by the Ohio Legislature in 1886 to investigate telephone charges, reported that 'it would be unwise so establish a fixed maximum rate to be charged uniformly throughout the State.'

"No bill of this kind has passed anywhere except in Indiana. This bill is substantially identical with that. Every Indianapolis newspaper urged its passage, and every one has since urged its repeal. The only investigation of this subject the Indiana Legislature ever made was after two years' trial of this act in January, 1887. This was first by the Committee of the House after repeated hearings of all who favored and opposed the bill. The committee reported unanimously in favor of its repeal, which passed the House by a vote of more than 2 to 1. The Senate Committe made the same report, but before final action the Legislature practically broke up owing to political differences, and thereafter about one-half of the Senate refused to vote on any subject. The Central Union Company, of Indiana, suffered an actual loss of $359.75 on its whole telephone business in that State, consisting of thirty-nine exchanges and all its toll lines for the quarter ending September 30. By the present time the law has closed eighteen of the Central Union's exchanges and seventy-one of its toll stations.

"The Central Union Company owns and operates the exchanges and toll lines of Ohio, Indiana, Illinois and Iowa, with the exception of some important points in each State. There are five different companies still operating exchanges in Ohio. They have no business connection. Our company does not have the cities of Cincinnati or Cleveland. There was a time shortly after the invention came into use when telephone enterprise was eager in establishing exchanges in many smaller towns and toll lines to isolated points which never have paid enough at present rates to justify their being rebuilt if destroyed. If the rates received for service at such points were reduced by the Legislature it would result in their necessary abandonment.

"The telephone is the only competitor the Western Union has. This latter charges 25 cents for a message and 25 cents for an answer, double the rate for a five minutes' communication by telephone. This bill fixes the same rate of payment for an exchange subscriber who is one hundred yards as for the one who is ten miles from the central office. The cost of construction for one may be fifty times that of the other, and the benefit received far greater. Under the Indiana law, the Supreme Court by mandamus required a line to the exchange to be specially in chief part built about five miles in length, the annual cost to this company of which for interest, service, royalty and depreciation, was admitted to be about $135. This bill ignores the great difference between both the cost and value of exchange service in large and small cities. It costs more and is worth more to be able to communicate by telephone to 1,000 than to 100 points. The present charges offer the cheapest communication ever known between two distant points. In London, England, what is equivalent to an expense for royalty is about half what it is here. The charge fixed by the Government, which practically supervises the business, is $100 per year. The Exchange is only open from 9 A. M. to 9 P. M., and is closed on Sunday. Labor there is twenty-five per cent. less than here, and material is still lower in proportion.

"The average life of out-door telephone plants and of switch-board fixtures can be shown to be about eight years. If sooner disused or taken down it has no money value for any purpose. New lines of wire and supports are constantly called for from which the subscribers soon drop off, leaving much of this construction useless. Under such conditions no business can earn only ordinary profits and preserve the principal intact. The time is at hand when most of the Central Union plants in Ohio should be replaced. This must be done to keep the service as good as it has been. This means that a large proportion of the capital stock invested in Ohio telephone plant will not be found but must be replaced by new and a larger principal or capital to maintain its fair earnings at present rates. You can talk today from New York to Albany or Boston as well as from here to the State Agricultural College. It should be so from Columbus to Cincinnati, to Toledo, to Cleveland. But that means double copper in place of single iron wires, and other more costly construction which will come of itself—but not under the bills before the Ohio Legislature."

Mr. Thomas was followed by Mr. J. P. McKinstry, of Cleveland, Ohio, general manager of the Erie Telephone Company, who explained the danger of tinkering with so important a commercial convenience as the telephone. He said:

"Telephone companies can prove that their margin of profit is less than they would receive from almost any other business. The statements of the expense of conducting the telephone business have been so often made before legislative bodies, and have been so frequently and thoroughly investigated that they have become a matter of record. The store rooms of every exchange are filled with discarded material, expensive switch boards, &c., which have been improved upon, originally costing thousands of dollars, not now worth as many cents. The more subscribers we have the greater the cost of operation. I have here a sworn copy of the December pay roll of the Cleveland Company showing the total amount paid employees for that month to be $3,015.47, or about $1 50 for each subscriber. The royalties paid for the same month amounted to $2,517.42, or $1.17½ per subscriber. These two items alone exceed the amount our friends propose to allow us to charge. If this bill becomes a law, from what source shall we derive our revenue to pay our rents, our insurance, our repairs? How provide for depreciation of our plant, to say nothing of any return for the money invested?

"The average monthly rental per subscriber received during 1887 was $5.71; average monthly expense of operating, $4 095; apparently monthly profit per subscriber, $1.61½. With an invested cash capital of over $400,000 after making the provisions for depreciation of plant which every prudent business man would make, and taking into consideration the damage from the elements to which we are peculiarly liable, I leave it for you to say whether our profits are enormous.

"In my opinion many years will not elapse before the business circles of the country will be bound together by telephone wires, while each little village and hamlet will be connected with the neighboring cities where its business interests are located. Although measures similar to the one before you have been introduced in the Legislature of nearly every State in the Union, in no case has the Committee of Investigation returned a favorable report."

The Government Telegraph.

The New York *Commercial Advertiser* comments as follows on the government telegraph proposition:

The objections to the institution of a government telegraph system are many and strong. We have several times set them forth, and we now briefly indicate the more important of them again:

1. Telegraphing is a business affair in no way lying within the boundaries of government functions. Like all other merely business affairs, it ought to be left to private enterprise.

2. Of the sixty millions of people in the country only about one million use the telegraph. The proposal is to make the entire people help to pay the telegraph bills of the one-sixtieth part of the people who use the telegraph; and that is manifestly an unjust use of the power of taxation, as clearly so as it would be to tax all the people in order to provide one-sixtieth of them with etchings or silver-plated teapots.

3. The institution of postal telegraphy must involve the very great increase of the army of federal officeholders and employees, which is an evil in itself and a thing fruitful of other evils.

4. The duplication of existing telegraph lines, which is necessary to the undertaking, will be a wanton waste of wealth, and to that extent the impoverishment of the people.

5. The measure is socialistic in its nature and tendencies, a practical acceptance of the doctrines of state socialism, which is the one thing most directly antagonistic to our American, republican system of government and the one thing most dangerous to it.

6. The measure is the outcome of those centralizing tendencies which now threaten the equilibrium and with it the very existence of our free government as seriously as the opposite tendency threatened the country in the times of secession. The highest duty of patriotism in these days is as clearly to resist the tendency to centralization—which, if permitted to run its course, can end only in the tyranny of national socialism—as a generation ago it was to resist the disintegrating tendency. The former danger of the republic was from the doctrine of state rights and limited functions in the national government, carried to a perilous extreme; the present danger of the republic is from the opposite doctrine of national paternalism carried to a like extreme. The introduction of this telegraph bill is but one of many manifestations of this tendency, it should be resisted as a threat to liberty by every patriot, however winningly it may woo support with promises of convenience and advantage.

Electric Lighting in Hartford.

Workmen at the new plant of the Hartford Electric Light Company are pushing the work toward completion. Only one of the large 150 horse-power boilers is as yet in operation, but the other two are being put into shape, and will be used as soon as they are ready. The new Russell 92 horse-power engine is keeping the four dynamos in operation, two of which are used for the incandescent lighting and two for the arc lights. The business of the company has increased to such an extent during the past few months that another 92 horse-power engine has been ordered. The engines and dynamos from the Pearl street plant will be removed to the plant on Kinsley street as soon as workmen can get the necessary foundations ready. The eight arc lights for Asylum Hill will not be ready for at least ten days yet, or until the workmen can get the poles erected and the wires strung.

The N. E. Weston Electric Car is now in regular commission between Cambridge and Boston, and is doing very satisfactory service.

There are a number of Sprague motors in use in New Orleans. Many merchants of that city have adopted them, and they are now in daily use, running elevators, printing presses, broom making machinery and manufacturing establishments of all descriptions.

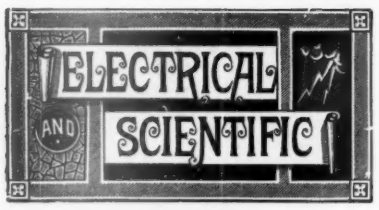
According to M. Guglielmo, of the Turin Academy, moist air becomes a source of leakage between conductors at and above 600 volts. If true, this may put a limit to the safe pressure adopted for electric railways, and may account for many cases of shock to the person not readily explainable under any other hypothesis. It is worth studying.

The Electric Street Railway Company, of Chattanooga, has been granted a franchise by the council of that city. A bond has been filed by the company indemnifying them against any case of litigation. The officers of the company are: A. Lyerly, President; G. N. Henson, V. P.; and F. H. Burris, S. W. Divine, A. W. Sidebottom, E. Scott, E. Watkins, D. T. Dodds.

The Electric Railway Company, of Asbury Park, N. J., has commenced extensive improvements on its plant in anticipation of the rush of summer travel. Four more miles of track, upon which a gang of laborers have commenced work, will be laid, and eight new cars have been ordered of a Philadelphia manufacturer, and will bring the total of rolling stock intended for use this summer up to 20 cars, half of which will be open cars designed for use in summer, while the others are to be of the ordinary kind and held ready for stormy weather.

The Julien Electric Storage Company has entered into a contract to furnish the Fourth avenue horse car railroad with ten cars to be run by the Julien storage battery. The engine and dynamos for charging the ten cars now under contract are being put into the stables at Madison avenue and Eighty-sixth street, and the Julien Company expects to have the cars running by the second week in May. They are now well under way, and are expected to be finer than any horse cars yet made. They will be 18 feet long as against 16 feet for the ordinary horse cars, and each seat will be divided off as in the elevated road. The cars will be lighted by electricity. If the first ten cars do their work satisfactorily, the whole road will be fitted up with electric motors next winter.

Frank A. Bartholomew and others asked last week for incorporation as the Boston Elevated Railway Company. The company proposes to use the Riley system, to be operated by electric motors, and asks for locations, including a belt line, in Boston, connecting the several railway stations and lines to Somerville, Brookline, West Roxbury and South Boston. The petitioners were represented by Hon. A. J. Hodder, attorney for the company, and Col. S. W. Nickerson, counsel. Both these gentlemen spoke of the necessity for rapid transit, and reviewed various possible schemes of accomplishing this result. Colonel Nickerson referred to elevated roads as the only possible solution of the rapid transit problem. He claimed that they were indispensable, that they were safe and profitable, and that they benefited, instead of injured, the surface roads. The speaker then proceeded to generalize upon the superiority of electric and other motors, and concluded by claiming for the Riley system superiority over all others. He read letters from officers of the Thomson-Houston and Vanderpole electric companies, agreeing to supply motors, and expressing entire confidence in the Riley system. Mr. George W. Mansfield, of the motor department of the T. H. Company, and a thorough electrician, testified to the entire feasibility of running cars of the Riley system by electricity. The hearing was adjourned.



* * An instrument called the autographometer has lately been devised, which autographically records the plan of the ground over which it is dragged. It can be carried about on a light vehicle, and when in use indicates the topography and differences of level of all places over which it passes.

* * Telephonic communication can be carried on between ships at sea by means of a sound-producing apparatus attached to each vessel, to be worked under the surface of the water. Each vessel also has a sound-receiving apparatus to take signals. Intelligible signals could be produced by this apparatus which would be transmitted through the water, in all directions, with considerable velocity.

* * At a recent meeting of the Royal Society a paper on the spectrum of the oxy-hydrogen flame was presented by Profs. G. D. Liveing and J. Dewar. They find that the spectrum of water extends, with diminishing intensity, into the visible region and also far into the ultra-violet. They have photographed these parts, using a single calcite prism and long exposure, and give a map and a list of wave-lengths of upwards of 780 lines.

* * Among the subjects for which the Société Industrielle of Amiens has offered a prize is "the best electric light installation in an industrial works." The light must have been in operation for at least a year, and it must be proved to be cheaper than gas made on the premises. Further, the installation must be equivalent to a gas system of not fewer than 300 jets. Detailed plans and descriptions must be sent in before 30th April next.

* * Little was added to our knowledge of electricity during 1887, but there was a remarkable development of its practical applications. One of the most important scientific discoveries was that sparks in tubes dissociated iodine, bromine and chlorine. Immense improvements have been made in the construction of dynamos, motors, accumulators and secondary generators, and in consequence the electric lighting and working of railroads and tramways has entered upon a commercial and useful stage. The application of powerful electric currents to smelting, as in the Cowles process for producing aluminum, and to welding, as proposed by Elihu Thomson, is gaining rapid progress, while the use of enormous dynamos for the deposition of pure copper from impure ores is gaining ground with giant strides.

The Vienna Electrical Laboratory.

The programme of this undertaking has just been issued by the directors of the Technological Museum, of which the laboratory forms a recently added section. The work will be superintended by Herr Carl Schlenk, and is to embrace experimental investigations of dynamos as regards output, power consumed, efficiency, and other matters; investigations and reports on executed installations for lighting, power, or chemical purposes, photometry of arc and glow lamps, calibration of measuring instruments, and investigations of primary and secondary batteries. A tariff has been fixed for the work, which will presumably be required very frequently. Thus, for testing a dynamo, the charge will be from £1 4s. to £4, according to size of machine; for testing a glow lamp, 16s. to £1 4s.; arc lamp, £1 4s. to £1 12s.; calibration of instruments, 5s. to £1 12s. Members of the museum obtain a discount of 25 per cent. off these charges. Where the work is of special nature, or for outside work, the charge is to be agreed upon beforehand. These fees are levied primarily with the object of covering working expenses. Any surplus is to be equally divided between the exchequer of the museum and the staff of the laboratory.

Discussion on the Continuous and Alternating Systems of Electric Lighting.

The attendance at the regular meeting of the Chicago Electric Club on the 5th instant, was far in excess of that of any previous meeting of that character.

The bare announcement of a discussion on alternate and direct currents in their application to lighting was sufficient to call out a large attendance. At the close of Mr. Leonard's very able paper, which we summarized in our last edition, the chair called for remarks. Mr. Sperry, almost alone, championed the alternate system, as neither Mr. Badt nor Mr. Slattery was present.

Mr. Sperry, while giving Mr. Leonard the full meed of praise to which he was entitled, confessed himself won to the alternate system by what he had recently seen at Pittsburgh. He thought the practical working of the system abundantly shown in the Pittsburgh plants, and also in Mr. Leonard's diagram number three, where the distance is increased 600 per cent., and the total increase in cost is but 25 per cent. That, taken in connection with the direct line on chart 4, showed the independence of distance of the alternating system. He thought that sparsely settled localities would soon be clamoring for incandescent light, and would have to be supplied from central station. A look at the Pittsburgh station, where were five 2,500 light machines, showed that the system was not limited in its application by large demand. We were at least three or four miles away from the source of power when we were on the Daft Railway and the other side of the river. We had understood that the matter of 50 volt lamps is important. That lamp has a more rigid filament. The life of these was stated at Pittsburgh to be much higher than 1,000 hours.

Mr. Leonard, replying to Mr. Sperry, thought a 50 volt lamp can be made to give longer life than a lamp of 110 volts; that is, a higher efficiency. He knew no lamp that is operated at less than three watts per c. p. Life of lamp beyond 1,000 hours is not desirable, beyond that the deterioration calls for a higher watt power, even 4, 5 or 6 per candle. Thought that while it is possible to convert 2,000 or 3,000 to 100 volts, it had not been perfectly satisfactory in its results. In practice, converters are put as near as possible to the lamps to reduce cost. Does not think that any practical operation of a three-wire system has been obtained by any alternate system. Alluding to the continuity of supply referred to, he stated that he had made no mention of any particular system or any particular weakness, but he noticed at Pittsburgh that, lying in quite close proximity to the five dynamos, was a spare armature, which somehow gave one the impression that it might be there for a possible emergency. While he was in Pittsburgh a new station of 5,200 lights was started, and during the first week's run they burned out four armatures.

As to the independence of distance spoken of, it seemed rather odd that, at Pittsburgh, the home of the alternating system, they should find it necessary to establish two systems. This multiplicity of supply sources must increase the expense of operation and maintenance.

The operation of lamps at a great distance from the station is, of course, a strong point, but he could not see that there was any advantage in that over a series system from the standpoint of continuity.

The Zipernowski-Deri Company had a converter tested, which showed an efficiency of 92 per cent. under full load, which, of course, is its condition for best showing. It had been acknowledged by the manufacturer's electrician that this was a machine specially made, and at an expense which would bar it from commercial use.

Rankin Kennedy, of England, recently took out a patent, which is intended to do away with the heat generated in conversion. He thought that if a man of his known electrical ability found it advantageous to get rid of the heat generated by the conversion, the conclusion was that there must be something there to warrant the expense, more than had been supposed to exist, as of loss, in that direction.

Mr. Leonard said that there were long distances which would have eventually to be reached by a still other form of machine, which he described--a continuous current converter.

One form of these consists of a dynamo wound for 125 volts and 400 amperes, with another independent winding of 1,200 volts and 40 amperes. At the farther end—at the water power—are placed continuous current generators of 1,000 or 1,200 volts. Two of these generators are placed on a three wire system. Their current of 40 amperes makes the cost of copper one-third what it would be with the 1,000 volts converter system. The conductors are led into town and carried to the upper story of some building where the converter and switch-board are placed. On this motor-generator, on the same armature and on the same field, is another winding which corresponds to 40 amperes and 1,000 volts. The continuous current is delivered to the brushes on the commutator for 1,000 volts, and the field is charged by the 1,000 volts current. As soon as the current is applied to the armature, the machine becomes a motor, and carries the second winding around, making this perform the function of a generator, giving 125 volts and 400 amperes. The two opposing directions of current flow can be made to exactly balance, so that there will be no sparking at the brushes, and no adjustment of these is necessary to counteract the counter electromotive force generated by the armature.

This motor-generator is only waiting until a decision is arrived at relative to the best form of armature. So far, Siemens' has been used, but inasmuch as an economy in lamp manufacture can be attained by using a higher speed, experiments are now being made with a gramme-like armature. There are no Foucault currents in this generator. Two of these may be placed in series, or a number can be placed in multiple arc on a three-wire system.

Mr Sperry thought there was but little heat loss in converters. Mr. Leonard could not see that in theatres the converter system was preferable on the score of economy. The armatures were made to ventilate as perfectly as possible, and the large amount of metal in the converter, could very readily dispose of a large amount of heat energy.

Mr. Andrews, of the Marr Construction Company, had seen 75 per cent. of the lights turned off from an alternate current circuit, and the lamps were hardly affected by the act. He thought that in a direct current perhaps, electrolysis developed faults which alternate currents would not. He read a letter from a gentleman in Denver, who is running an alternate plant, who said the company had never had a hitch since starting. He had run the two machines in multiple, each with full load, and each taking the same number of amperes with large and small loads. They had run a No. 1 and a No. 2 in multiple, and two No. 2 machines in multiple. * * * Several of the men has received shocks from the 1,000 volt current, and are none the worse for it. He had taken it twice personally. Some of the machines had run continuously for a week without shutting down. "Our distribution has panned out splendidly, not half a volt difference in pressure anywhere in town."

Mr. Leonard said that while almost every plant of that character had been run in multiple, this was only experimental so far as he had been able to learn. Reversals of current must synchronize perfectly, otherwise the proportion of load is shifted, to the detriment of the service. One machine will act against the other. The matter of electrolysis should be carefully considered. The letter read by Mr. Andrews stated that at Denver the longest feeder is 8,000 feet. I know of an Edison station where there is a feeder over 6,000 feet, and under proper conditions I would not hesitate to operate it at 8,000. At 6,000 feet the cost for copper wire would be identical with that of conductors and converters of the alternating system. At 3,000 feet, which I consider the more common practice, the cost is in favor of the continuous system, being less than half that of conductor and converter.

I emphasize the two points in which I consider the alternate system inferior—reliability and permanency.

The statement that a machine was run for an entire week was not qualified by a statement of the load. This matter was not touched upon.

Mr. Bliss: I think it is assumed that the cost of generators is the same in the two cases. Is this the fact?

Mr. Leonard: While I assumed that total cost was the same, I stated that possible differences would not cut any appreciable figure.

If they cannot supply an alternate current generator cheaper than a continuous current generator, I certainly think there is a great field for them in isolated lighting. If the regulation is more perfect, as has been claimed, this, with the absence of a commutator, should give the system a decided advantage.

Central Station Lighting by Storage Batteries.

At the last meeting of the Society of Telegraph Engineers and Electricians, this system of distributing electricity was warmly advocated by Mr. Gordon and Mr. Crompton, the latter gentleman speaking from personal experience in the use of storage batteries for this purpose. As this is a question of great importance to electrical engineers and contractors, it will be of interest to our readers if we give a short account of a visit we recently paid to Mr. Crompton's central station at Kensington Court, to inspect the machinery and distributing plant. Since we published an illustrated description of this station in our issue of the 18th February, 1887, the plant has been duplicated. There are now installed two boilers and two direct acting steam dynamos of the Willans-Crompton type. One of the dynamos is a double horseshoe horizontal machine, and the other is of the inverted single horseshoe type. Each machine is able to supply current equal to from 40 to 45 h. p., but only one machine is at present required at a time. At one end of the machine room there are stages for several batteries of storage cells; but only one battery is at present in use, and is connected by means of an ingenious switch board with three lighting circuits, all of which have a very low resistance, so that the loss of pressure in the mains is only trifling. At present the routine of the installation is as follows: One of the engines is started about three o'clock in the afternoon, and begins charging the battery. At the same time the current is sent out from the battery to the various lighting circuits, and these connections are never interrupted during the whole twenty-four hours, so that consumers can have the light at any moment of the day or night. The consumption reaches a maximum towards seven o'clock in the evening, and by about eleven o'clock it has again sufficiently declined to allow of the engine being stopped. Meanwhile the batteries have received a sufficient charge to last till the next afternoon. After stopping the engine at eleven o'clock, the station is locked up and left to itself. The charging current and the discharging current are both measured by Aaron's coulomb meters, and in the consumer's houses there are installed either Ferranti or Cauderay meters. The mains in the streets are of a novel construction, and consist of bare copper strips supported on porcelain insulators within a brick culvert set in cement. At certain intervals a flag of the footpath is provided with lifting rings, so that it may be lifted to give access to the mains. The house connections are simply soldered on to the copper strips, the switch and the fuse being placed, not in the culvert, but at the entrance to the consumer's premises. Each main is protected by fuses at the station, and potential wires are carried back from the far end of the main to the station, to indicate the pressure at the lamps. The attendant is therefore enabled to regulate, by means of the switch board already mentioned, the number of cells working on any particular circuit, so as to maintain the pressure constant within one or two volts.—*London Industries.*

* * Silver, generally a very desirable metal, is a source of great annoyance in the manufacture of white lead, for, if present in an appreciable quantity, it spoils the color of the finished product, owing to the well-known blackening effect of light upon the salts of silver.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 13, 1888.

379,255 Incandescent lamp socket; Frank Thone, Oskaloosa, Iowa.

379,284 Dynamo electric machine; Lewis C. Rice, Denver, Col.

379,339 Fire alarm signal box; George M. Stevens, Cambridge, Mass.

379,344 Apparatus for dressing off the commutator of dynamo-electrical machines; Daniel J. Tittle, Jr., Albany, N. Y., assignor to Edward F. Hackett, same place.

379,368 Telegraphic pen; Herschel P. Copeland, East Orange, N. J.

379,372 Non-polarizing constant current battery; Frank J. Crouch, Eugene City, Oregon.

379,396 Electric gas lighter and extinguisher; Geo. L. Hogan, Olmstead, assignor to himself, and Berry T. Conway and James A. Kelly, both of Lebanon, Ky.

379,404 Device for returning signals in district telegraph systems; William V. Lockwood, Waterbury, Conn., assignor of one-half to G. S. Parsons, same place.

379,406 Automatic electric spacing mechanism for type-writers; James F. McLaughlin, Philadelphia, Pa.

379,408 Underground conduit; M. Richards Muckle, Jr., Philadelphia, Pa.

379,453 Working metals by electricity; Nicholas de Benardos, St. Petersburg, Russia.

379,459 Bell cord for cars; William Glasgow and Samuel S. Stevens, Chicago, Ill., assignors to the Combined Electric and Trip Bell Cord Company.

379,465 Apparatus for electric bleaching; Eugene Hermite and Charles F. Cooper, Dalston, County of Middlesex, England, assignors of one-third to Edward James Paterson, same place.

379,466 379,467 Regulation of electric motors; Daniel Higham, Philadelphia, Pa., assignor to The Higham Electric Motor Company, same place.

379,501 Switch for electric light and motor circuits; Frederick W. Brann and G. Irving Kinney, San Francisco, Cal.

379,503 Pneumatic carrier; George D. Burton, New Ipswich, N. H.

379,509 Electric surface railway; John A. Enos, Boston, assignor to himself, William C. Otis, Nahant; E. Herbert Ingalls and Paul West, both of Brookline, and William E. Plummer, Newton, Mass.

379,511 Machine for regulating time pieces; William B. Farrar, Greensboro, N. C.

379,532 Test circuit and apparatus for electrical cables; Isaiah H. Farnham, Malden, assignor to the New England Telephone and Telegraph Company, Boston, Mass.

379,535 Telegraph wire; William Hewitt, Chambersburg, N. J.

379,551 379,552 Primary electric battery; Henry Woodward, Detroit, Mich., assignor, by mesne assignments, to the Woodward Electrical Company, same place.

PATENTS.

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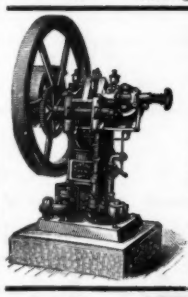

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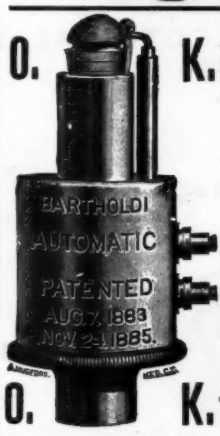

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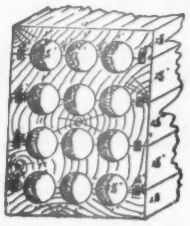

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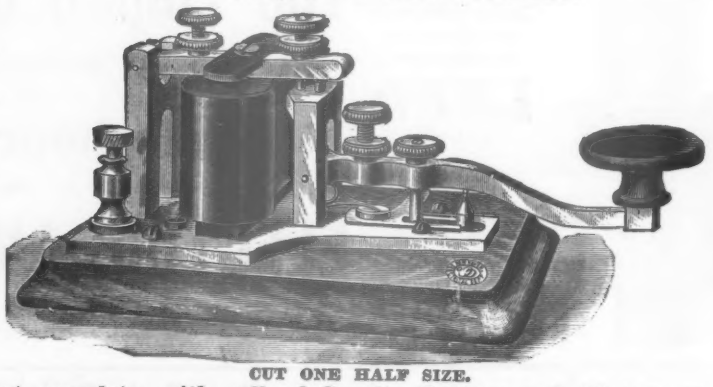

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